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A FLORA OF NORTHWEST AMERICA.

CONTAINING
BRIEF DESCRIPTIONS OF ALL THE KNOWN INDIGENOUS AND
NATURALIZED PLANTS GROWING WITHOUT CULTIVATION
NORTH OF CALIFORNIA, WEST OF UTAH, AND SOUTH OF
BRITISH COLUMBIA.

BY
THOMAS HOWELL

VOL. I.

PHANEROGAMÆ.



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FASCICLE 7, ARACEÆ TO PINACEÆ

Price Fifty Cents.

PORTLAND OREGON,
July 20th, 1902.

August 16th, 1902

FLORA OF SOUTH AFRICA

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PORTLAND OREGON,
Aug. 10th, 1908.

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by a spathe. Lobes of the perianth nearly or quite equal, linear. Stamens 3, inserted on the throat of the perianth. Ovary fusiform, completely or incompletely 3-celled by the intrusion of the placentæ: ovules numerous: stigma 3-lobed. Fruit an ovoid many-seeded capsule enclosed in the marcescent tube of the perianth. Seeds ovoid, striate.

H. dubia Mac M. Met. Miun. 138. *Schollera graminifolia* Willd. Aquatic perennial: stem slender, forked, often rooting at the nodes. 1-4 feet long; leaves linear, flat, acute, their sheaths thin, furnished at the top with small acute stipule-like appendages: spathes 1- or 2-flowered: flowers light yellow: perianth-segments narrow, 3-4 lines long, the tube 1-3 inches long; capsule 1-celled, torulose, 3-4 lines long. In ponds, Oregon to California and the Atlantic States.

ORDER C ARACEÆ Neck. Act. Acad. Theod. Palat. ii, 462.

Glabrous perennial herbs with all radical or alternate leaves and perfect, monœcious or diœcious flowers sessile and crowded upon a spadix which is surrounded by a simple spathe. Perianth none, or of 4 scale-like segments. Stamens 4 in our species: filaments very short: anthers 2-celled, opening by pores or slits. Ovary one- to several-celled, with one to several ovules in each cell. Style short or wanting: with terminal mostly minute and sessile stigma. Seeds various, mostly minute and albuminous.

1 LYSICHITON Schott Prodr. Aroid. 421.

Acaulescent swamp herbs with large flat leaves from a thick horizontal rootstock and numerous small flowers on a spadix surrounded by a spathe with a sheathing base that at first envelopes it but at length becoming long exerted upon a stout peduncle. Flowers perfect, crowded and covering the spadix, with 4-lobed perianth and 4 stamens opposite to the lobes. Filaments short and flat: anthers 2-celled, opening upward. Ovary conical, 2-celled, with 2 horizontal orthotropous ovules. Stigma depressed. Fruit fleshy, somewhat immersed in the rachis and coalescent.

L. Kamtschaticensis Schott l. c. Leaves 1-4 feet long, 3-18 inches wide, oblong to oblong-lanceolate, acute, narrowed below to a short margined petiole or sessile: spathe yellow, with a broad acute blade 2-6 inches long, narrowed below to a sheathing petiole 3-10 inches long: peduncle very stout, 8-12 inches long: spadix broader, 2-4 inches long, densely flowered. Common in swamps, California to Alaska and Kamtschatka.

ORDER CI TYPHACEÆ J. St. Hil. Expos. Fam. i, 60.

Aquatic perennial herbs with creeping rootstocks, cylindrical solid stems, alternate linear entire sessile leaves and monœcious flowers in heads or on a spadix without perianth, the upper staminate, the lower pistillate. Stamens and ovaries intermixed with bristles or scales. Anthers linear, longitudinally dehiscent. Ovaries one- or two-celled, one-ovuled, with slender style and one-sided stigmas. Fruit nut-like. Seeds pendulous, ana-

tropous, with straight axile embryo and copious albumen.

- 1 *Sparganium* Flowers in globular heads with foliaceous bracts.
- 2 *Typha* Flowers in a cylindrical compact terminal spike.

1 SPARGANIUM L. Sp. 971.

Aquatic herbs with erect or floating stems, linear alternate leaves and small flowers densely crowded in globose heads on the upper part of the stem and branches, the staminate heads uppermost. Spathes linear, immediately beneath or at a distance below the head. Perianth represented by a few chaffy scales. Stamens usually 5, with distinct filaments and oblong or cuneate anthers. Ovary sessile, mostly 1-celled. Fruit nut-like.

S. eurycarpum Engelm. in Gray's Man. ed. 2, 430. Stems stout, 2-8 feet high, branching: leaves linear, flat, slightly keeled, the lowest 2-6 feet long, the upper shorter: staminate heads numerous; pistillate heads 2-4 on the stem or branch, sessile or peduncled, compact, 10-16 lines in diameter when mature: style 1; stigmas 1 or 2: nutlets sessile, 3-5 lines long, obtusely 4-5-angled, narrowed at base, the top rounded, flattened or depressed, abruptly tipped with the style: scales as long or nearly as long as the fruit, and as many as its angles, often with 2 or 3 outer ones, somewhat spatulate, the apex rounded and denticulate or erose. In marshes and along streams, California to Brit. Columbia and the Eastern States.

S. androcladum Morong Bull. Torr. Bot. Club. xv, 78. Stems slender, more or less branching 10-20 inches high; pistillate heads 3-7, sessile or the lowest peduncled: style 1; stigmas 1, rarely 2: heads 6-12 lines in diameter when mature: scales oblong, as long as the nutlets or shorter: nutlets fusiform, 2-3 lines long, often strongly contracted at the middle, tapering into the style, pedicelled. In ponds, Oregon to Brit. Columbia and the Eastern States.

S. simplex Huds. Fl. Angl. ed. 2, 401. Stems slender, 2-20 inches high, simple: leaves more or less triquetrous, 2-4 lines wide: staminate heads 4-7, pistillate 2-6, sessile, or the lowest peduncled, 5-8 lines in diameter when mature: scales about half as long as the nutlets, denticulate: nutlets fusiform or narrowly oblong, obtusely angled at the apex, more or less contracted in the middle, pedicelled: stigma linear, as long as the style. Borders of ponds and streams, California to Alaska and across the Continent.

Var. angustifolium Engelm. in Gray Man. ed. 5, 481. Floating in deep water: leaves very long, 1-2 lines wide, their sheaths often inflated at base: pistillate heads 1-4, 3-7 lines in diameter. In mountain lakes and slow streams, California to Oregon Newfoundland and New York.

S. minimum Fries Sum Veg. ii, 560. Floating: stems very slender, 4 inches to 3 feet long: leaves very thin and lax, 1-3 lines wide: staminate heads 1 or 2, pistillate 1-3, sessile 2-5 lines in diameter when mature: scales about half as long as the fruit, denticulate: stigmas oval, often oblique: nutlets ovoid, slightly triangular, tapering abruptly into the style, 1-2 lines long sessile or nearly so. In ponds and streams, Oregon to Utah, Michigan, New Jersey and New Brunawic.

TYPHA L. Sp. 971.

Marsh or aquatic plants with creeping rootstocks, simple erect terete stems, linear flat ensiform leaves with sheathing base, and very numerous small flowers in dense terminal spikes subtended by spathaceous usually fugaceous bracts, the staminate spikes

uppermost. Ovaries long-stipitate, 1-celled, surrounded by numerous bristles and clavate rudimentary ovaries. Styles filiform. Fruit nut-like, small, usually splitting on one side. Seeds linear striate.

T. latifolia L. Sp. 971. Stems stout, 4-8 feet high: leaves nearly equalling or exceeding the stem, 3-12 lines wide: pistillate spike dark brown or black, at length an inch in diameter; the staminate portion usually contiguous, each 3-12 inches long: pollen grains in 4's: pistillate flowers without bracts: stigmas rhomboid or spatulate. In marshes throughout North America, Europe and Asia, except the extreme north.

T. angustifolia L. Sp. 971. Stems slender, 2-10 feet high; leaves 2-6 lines wide, somewhat convex on the back: spikes light brown, the staminate and pistillate portions usually distant, the two together sometimes 15 inches long, the pistillate portion when mature 2-8 lines in diameter and provided with bractlets: pollen grains simple: stigmas linear or linear-oblong. In marshes, California and Oregon to the Eastern States and Europe.

ORDER CII LEMNACEÆ Dumort. Fl. Belg. 147. (1827.)

Very small floating stemless herbaceous plants consisting of flattened disk-like fronds with one or more rootlets from the middle below, and monoecious flowers without perianth imbedded in the frond. Flowers consisting of 1-2 stamens or a flask-shaped 1-celled several-ovuled pistil. Style simple, with funnelform stigma. Fruit a 1-6-seeded utricle. Seeds comparatively large, with straight axile embryo, albuminous.

1 *Lemna* Frond 1-5-nerved, with a single rootlet.

2 *Spirodela* Frond 7-11-nerved, with several rootlets.

1 LEMNA L. Sp. 970.

Fronds 1-5-nerved, containing numerous acicular raphides, destitute of vascular tissue proliferous from a lateral slit, usually on each side near the base, with a single rootlet. Flowers marginal, bracteate, diandrous. Filaments slender: anthers didymous, each cell bilocular by a transverse partition, dehiscing transversely. Seeds 1-6, mostly ribbed.

L. trisulca L. Sp. 970. Fronds thin, oblong or oblanceolate, 6-9 lines long, attenuate at base into a slender stalk, very obscurely 3-nerved, often without rootlets, usually several series of offshoots remaining connected: bracts sac-like: seeds ovate, amphitropous, with small round operculum. In ponds, throughout most of North America: also in Europe and Asia.

L. minor L. Sp. 970. Fronds round to elliptic-ovate, 1-3 lines in diameter, rather thick, very obscurely 3-nerved: seeds oblong-obovate, amphitropous, with prominent rounded operculum. Common in ponds in all parts of the world.

2 SPIRODELA Schleiden Linn. xiii. 391. (1839.)

Fronds 7-12-nerved. Rootlets several, with axile vascular tissue. Anther-cells bilocellate by a vertical partition and longitudinally dehiscent. Ovary 2-ovuled.

S. polyrhiza Schleiden l. c. Fronds round-obovate, 2-5 lines long, thick, flat and dark green above, slightly convex and purple beneath, pal-

mately 5-10-nerved, each with a central cluster of 2-11 elongated rootlets. Common in still water throughout most parts of the world.

ORDER CIII VALLISNERIACEÆ Dumort. Anal. Fam. 54.

Submerged or floating aquatic herbs with various leaves and regular mostly dioecious flowers. Perianth 3-6-parted: the segments all petaloid, or the outer ones smaller and herbaceous, the tube adherent to the ovary at its base. Stamens 3-12, distinct or monadelphous. Anthers 2-celled. Ovary 1-celled with 3 parietal placenta or 6-9-celled. Styles 3-9, with entire or 2-cleft stigmas. Fruit an indehiscent few-many-seeded utricle, ripening under water.

1 PHILOTRIA Raf. Am. Month. Mag. ii, 175.

Aquatic perennial herbs with leafy branched stems, numerous opposite or whorled sessile 1-nerved leaves and small flowers in membranaceous spathes. Flowers polygamo-dioecious, solitary and sessile in an axillary spathe. Perianth small in the staminate flowers with 3 scarcely united greenish sepals and as many narrow petals: the pistillate with greatly elongated filiform tube and 6-parted spreading limb. Stamens 3-9, with short filaments united at base. Ovary 1-celled, with 3 parietal placenta, few-ovuled. Style coherent with the perianth-tube: stigmas 3, bifid or emarginate. Fruit a few-seeded utricle.

P. Canadensis Britton Science (II) ii, 5. *Anacharis Canadensis* Pl. Stems 4 inches to 3 feet long, according to the depth of the water, much branched: leaves linear or elliptic, acute or obtuse, serrulate or entire, 2-7 lines long, 1-2 lines wide: flowers axillary, the staminate minute, sessile, breaking off at the time of flowering and rising to the surface where they shed their pollen: pistillate flowers expanding on the surface of the water which they reach by the elongation of the slender tube which varies in length from 2-12 inches: stigmas spreading, papillose or pubescent. Common in ponds, nearly throughout North America.

ORDER CIV NAIADACEÆ Lindl. Nat. Syst. ed. 2, 366.

Aquatic herbs with slender often branching leafy stems, flat or filiform leaves and perfect, monoecious or dioecious flowers in axillary spikes or solitary or spadaceous. Perianth of 4 segments or a hyaline envelope or wanting. Stamens 1-4, rarely more, distinct and hypogynous in the perfect flowers, solitary or connate in the sterile. Anthers extrorse, 1-2-celled. Ovaries 1-6, distinct, or rarely connate, 1-celled, mostly 1-ovuled. Fruit follicular or capsular or an indehiscent berry or utricle. Embryo large, often curved. Albumen none.

* Perianth membranaceous and cup-shaped or none.

+ Flowers monoecious or dioecious: ovary solitary, sessile: stamen 1.

- 1 *Najas* Stems slender, with opposite or ternate leaves: flowers dioecious: solitary or clustered, axillary: perianth none in pistillate flowers, cup-shaped and membranaceous in staminate: style with 2-4 subulate stigmas

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- 2 *Zostera* Stems slender, from creeping rootstocks: perianth wanting: ovaries and stamens alternate in 2 vertical rows on the inner side of a margined leaf-like enclosed spadix: ovaries pendulous: stigmas 2.
- 3 *Phyllospadix* Stems floating, from creeping rootstocks: flowers dioecious, without perianth: anthers sessile, in 2 rows on a spadix: ovaries in 2 rows on the inner side of a margined enclosed spadix, ascending: stigmas 2, linear, sessile.
- 4 *Lilaea* Annual stemless plants: flowers monœcious; staminate in close spikes on scapes under a single bract; pistillate flowers at the base of the leaves with very long styles, or in dense heads on scapes; stigmas capitate
- + + Ovaries about 4, nearly sessile, becoming more or less stipitate.
- 5 *Zannichellia* Leaves opposite: flowers monœcious, axillary or nearly so: anther solitary, on a slender naked filament: pistillate flowers solitary, with a cup-shaped membranaceous spathe or perianth: stigma peltate.
- 6 *Ruppia* Leaves alternate: flowers perfect, 2 or more on an enclosed spadix, at length long-exserted, without perianth: anthers 2, sessile: stigma depressed.
* * Flowers perfect, with herbaceous 4 parted perianth, in a peduncled spike.
- 7 *Potamogeton* Ovaries and anthers 4, sessile: stigma sessile.

1 NAIAS L. Sp. 1015.

Slender branching aquatic wholly submerged plants with opposite, alternate or verticillate leaves with sheathing bases, and inconspicuous monœcious or dioecious flowers in axillary clusters or solitary. Staminate flowers of a single stamen and a membranous tubular 4-lobed perianth within a small cup-shaped membranous spathe. Anther 4-celled, nearly sessile: pollen granular Pistillate flowers without perianth or spathe, the oblong ovary terminated by a short style and 3-4 narrowly subulate stigmas. Fruit a membranous utricle, filled by the single erect anatropous seed.

N. flexilis Rost. & Schmidt Fl. Sed. 384. Stem slender, dichotomously much branched 6-18 inches long: leaves linear, acuminate or abruptly acute, 6-12 lines long, $\frac{1}{2}$ -1 line wide, numerous and crowded upon the upper part of the branches, with 25-30 minute teeth on each side; sheaths obliquely rounded, with 5-10 teeth on each margin: fruit ellipsoid, with very thin pericarp, 1-2 lines long: style long, persistent; stigmas short: seed smooth, shining, straw-color, sculptured with 30-40 rows of nearly square or hexagonal reticulations. In ponds and streams, throughout nearly all parts of North America: also in Europe.

N. Gaudalupensis Morong Mem. Torr. Bot. Club. iii, 60. Stem nearly capillary 1-2 feet long, widely branched from the base: leaves numerous, 6-9 lines long, $\frac{1}{4}$ - $\frac{1}{2}$ line wide, acute, opposite or in fascicles of 2-5, frequently recurved, with 40-50 teeth on each margin: fruit about a line long; pericarp dark and strongly marked by 15-20 rows of hexagonal or rectangular reticulations which are transversely oblong: seed straw-color, not shining. In ponds and streams, Oregon to Nebraska and Texas: also in tropical America.

2 ZOSTERA L. Sp. 968.

Marine plants with creeping rootstocks, branching compressed

stems, long grass-like entire few-nerved leaves and inconspicuous flowers on an enclosed spadix. Flowers monoecious, without perianth, the single stamens and ovaries arranged alternately in 2 rows upon the face of a linear-oblong leaf-like sessile spadix enclosed in the dilated membranous base of a leaf. Anther 1-celled, sessile; pollen thread-like. Ovary attached near its apex, beaked by a short style with 2 linear deciduous stigmas, with a single pendulous orthotropous ovule. Fruit utricular, oblong. Seed with subcrustaceous testa. Embryo split longitudinally and enclosing the long linear curved plumule.

Z. marina L. Sp. 968. Stems rather fleshy, 1-7 feet long: leaves ribbon-like, obtuse at the apex, 1-8 feet long, 2-4 lines wide, with 3-7 principal nerves; spadix 1-3 inches long: flowers crowded, usually from 10-20 of each kind on the spadix: at anthesis the stigmas are thrust through the opening of the spathe and drop off before the anthers of the same spadix open: the anthers at maturity work their way out and shed their glutinous stringy pollen into the water: seeds cylindric, strongly about 20 ribbed, about $1\frac{1}{2}$ lines long, truncate at both ends. In bays and streams along the coast, Alaska to California and on the Atlantic coast and Europe.

Z. latifolia Morong, Mem. Torr. Bot. Club, iii, 63. Rootstocks very thick: stems stout 2-10 feet long: leaves 2-4 feet long, 3-6 lines wide, the broadest 10-13-nerved: spadix 2-3 inches long: fruit $1\frac{1}{2}$ -2 lines long, cylindric, with a straight beak as long as itself and attached to the spadix by a short stipe, distinctly 20-25-costate. In bays, Puget Sound to Calif.

3 PHYLLOSPADIX Hook. Fl. ii, 171.

Perennial marine herbs with thick rootstocks, slender stems' elongated linear leaves and inconspicuous dioecious flowers on a spadix. Staminate flowers of numerous sessile anthers in 2 rows crowded upon a spadix. Anthers 1-celled dehiscing by a vertical slit, dorsally attached near the middle: pollen thread-like. Pistillate flowers of sessile ovaries attached above the base, attenuate into a short style. Stigmas 2, capillary. Fruit a coriaceous utricle.

P. Scouleri Hook. l. c. Stems very stout, an inch or two high, bearing solitary spathes: leaves 2-6 feet long, 1-2 lines wide, 3-nerved, with many fine striae between the nerves: spadix appendages on both kinds of flowers elliptical, about 6 lines long; fruit broadly flattened, the lobes half as broad as the body. On rocks that are exposed at low tide along the coast, Oregon to Alaska.

4 LILÆA Humb. & Bonpl. Pl. Ag. i, 221. (1808.)

Annual acaulescent paludose plants with terete leaves and dimorphous flowers sessile among the leaves and in heads on simple scapes. Staminate and pistillate flowers in the same or separate heads, without perianth. Stamens solitary. Anthers nearly sessile, rounded, 2-celled, subtended by a hyaline bract. Ovaries naked, sessile and erect in the axils of the leaves with very long styles and in heads on exserted scapes with short styles. 1-celled and 1-ovuled. Stigma capitate. Fruit coriaceous, ovoid, indehiscent, compressed and ribbed, the upper narrowly winged, the

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L. subulata Humb. & Bonpl. l. c. Leaves 6 inches to 2 feet long or more, 1-2 lines thick: heads crowded, 6-12 lines long, on scapes shorter than the leaves: staminate bracts narrowly oblong, obtuse, ½ line long, twice longer than the anthers: radical fruits 3 lines long, the filiform styles often nearly as long as the scapes: upper fruits elliptical, acute, somewhat smaller. In shallow water or mud, Vancouver Island to South America.

5 ZANNICHELLIA L. Sp. 969.

Very slender immersed branching aquatic herbs with filiform flattened mostly opposite leaves, with small free membranous stipules, and inconspicuous monœcious flowers in axillary clusters. Staminate flowers of a single naked stamen with elongated filament and 2-celled anther. Pistillate flowers usually in the same axils, of 2-5 sessile or shortly stipitate ovaries in a membranous cup-shaped perianth or spathe: style short, with peltate stigma. Ovule solitary, suspended. Fruit an obliquely oblong coriaceous nutlet, somewhat compressed, beaked by the short style. Seeds with membranous testa. Embryo slender, the attenuate cotyledonary end bent into a coil.

Z. palustris L. Sp. 969. Stems 2 inches to 2 feet long, branching and leafy: leaves about 3 inches long, ¼ line or less wide, thin, 1-nerved: fruit sometimes incurved, often more or less toothed on the back. 1-1½ lines long, about twice longer than the style, usually becoming shortly stipitate and often also pedunculate. In fresh-water ponds and slow streams, throughout most parts of the World.

6 RUPPIA L. Sp. 127.

Slender branching submersed herbs growing in brackish or salt water, with filiform or capillary alternate leaves, with broadly sheathing bases, and small perfect flowers enclosed in the base of the leaves. Flowers on a capillary spadix-like peduncle, without perianth, consisting of 2 sessile anthers, each with 2 separate cells, attached by the back to the peduncle, having between them several pistillate flowers in 2 sets on opposite sides of the rachis, the whole at first enclosed in the base of a leaf, the peduncle at length long exerted and bearing the ovaries in 2 clusters at the end. Ovaries at first sessile, with nearly sessile depressed stigmas and solitary suspended campylotropous ovules. Fruit obliquely ovoid, very shortly beaked, on elongated slender stipes, hard and drupe-like. Seed with membranous testa. Embryo ovoid, with short cotyledon and short lateral plumule.

R. maritima L. Sp. 157. Stems elongated, filiform, 6-20 inches or more high, leafy: leaves 2-4 inches long, ½ line wide, with usually broadly dilated bases: flowers 2-8, in a short close spike: fruiting peduncle 3-6 inches long, contorted: fruit 1½ lines long, the stipe 1-12 lines long. In brackish or salt pools along the coast. Alaska to California, and in most parts of the world.



7 POTAMOGETON L. Sp. 126.

Submersed aquatic herbs with slender jointed branching stems, mostly alternate leaves with scarious stipules and perfect flowers in peduncled axillary spikes. Perianth herbaceous, of 4 narrow valvate segments. Stamens 4, opposite to the segments, with nearly sessile 2-celled anthers. Ovaries usually 4 and sessile, with oblique depressed nearly sessile stigmas and solitary ascending campylotropous ovules. Fruit somewhat compressed, ovate, drupe-like, with a crustaceous nutlet within. Seed with membranous testa and strongly curved or spiral embryo.

* Floating leaves more or less coriaceous, with a dilated petioled blade, different in form from the thinner submerged ones: stipules free: spikes cylindrical, mostly dense, not interrupted.

P. natans L. Sp. 126. Stems 1-4 feet long, simple or sparingly branched: floating leaves thick, ovate-elliptic to lanceolate, acutish, slightly cordate at base, usually 2-3 inches long, mostly shorter than the petiole, 21-29-nerved: stipules long and conspicuous, acute or acuminate; upper submersed leaves often with a small lanceolate blade, the lower reduced to petioles: peduncles stout, bearing an emersed spike 1-2 inches long: fruit turgid, obliquely obovate, acute, 2 lines long: nutlets with a small deep pit on each side: embryo nearly circular. In ponds and ditches, Alaska to California and across the Continent: also in Europe and Asia.

P. amplifolius Tuckerm. Am. Journ. Sci. (II) vi, 225. Stems often stout, simple: floating leaves elliptic to oblong-lanceolate, acute, mostly rounded or slightly cordate at base, 2-4 inches long, 30-50-nerved, on petioles about as long as the blade; stipules large and conspicuous: submerged leaves often very large, mostly falcate and somewhat undulate, acute, attenuate to a usually short petiole: spikes thick and often dense, 1-3 inches long, on very short peduncles: fruit over 2 lines long, 3-keeled, with a broad stout beak: sides of the nutlet not pitted: embryo slender, the cotyledon incurved. In ponds and streams, Brit. Columbia to California and the Eastern States.

P. pulcher Tuckerm. Am. Journ. Sci. xlv, 38. Stems simple, terete, black-spotted, 1-2 feet long: floating leaves usually massed at the top on short lateral branches, ovate or round-ovate, subcordate, 2-5 inches long, many-nerved: petioles about as thick as the stem, 2-4 inches long, spotted: submerged leaves of two kinds, the uppermost lanceolate, long-acuminate, undulate, 3-8 inches long, 6-8 lines wide, tapering into a short petiole, the lowest much thicker, spatulate, oblong or ovate, on petioles $\frac{1}{4}$ -4 inches long: stipules 2-carinate: spikes dense, long-peduncled: fruit about 2 lines long, turgid, tapering into a stout apical style, the back sharply 3-keeled: embryo coiled. In ponds, Idaho to Main and Georgia.

P. Nuttallii Cham. & Sch. Linn. ii, 226. *P. Claytonii* Tuckerm. Stems compressed, mostly simple, 2-6 feet long: floating leaves narrowly oblong to elliptic, 1-3 inches long, 11-17-nerved, obtuse or acutish, attenuate below into a flattened petiole usually shorter than the blade: stipules sheathing, soon deciduous, an inch or less long: submerged leaves very thin linear, 2-5 inches long, 5 nerved, with a close cellular reticulation between the middle nerves: spikes 6-12 lines long, on short stout peduncles: fruit obovate, 3-keeled, slightly apiculate, 1-1 $\frac{1}{2}$ lines long: nutlets slightly depressed on the sides: embryo coiled nearly 1 $\frac{1}{2}$ times. In ponds and streams, California to Alaska and the Eastern States.

P. alpinus Balbis Mis. Bot. 13, (1804), *P. rufescens* Schrad. (1815.)

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Stems simple or branched, 1-2 feet high, somewhat compressed: floating leaves often wanting, rather thin, 11-17-nerved, narrowly oblong-elliptic or oblanceolate, 2-4 inches long, acutish, attenuate into a very broad short petiole; submerged leaves as large as the floating ones, sessile or nearly so, mostly attenuate, narrowly oblong-lanceolate, 3-12 inches long, 3-8 lines wide: stipules broad, usually acuminate, 6-12 lines long or more: spikes 1-2 inches long, rather slender, on stout often elongated peduncles: fruit round-obovate, $1\frac{1}{2}$ lines long, compressed acutely margined, beaked by the rather long style: nutlets pitted on both sides: embryo nearly circular. In alpine ponds, Brit. Columbia to California and the Eastern States, also in Europe.

P. lonchites Tuckerman Am. Journ. Sci. (II) vi, 226. Stems rather slender, branching, terete, 3-6 feet long: floating leaves thickish, 11-23-nerved, long-elliptical to oblong-lanceolate, usually 2-4 inches long, 9-15 lines wide, acute or acutish, rather abruptly narrowed into a petiole, usually longer than the blade; submerged leaves thinner, mostly linear-lanceolate, 3-12 inches long, 2-12 lines wide, attenuate at base, the lower sessile: stipules 1-4 inches long: spikes dense, 1-2 inches long, on stout peduncles: fruit obliquely obovate, 1-2 lines long, carinate, acute: nutlets somewhat 3-keeled, the sides scarcely impressed: cotyledons incurved above the base of the slightly incurved embryo. In ponds and slow streams, Washington to California and the Eastern States.

P. heterophyllus Schreb. Special Fl. Lip. xxi, 1771. Stems very slender, branching: floating leaves rather thin, 9-15-nerved, oblong-elliptic, acutish, 1-2 inches long, rounded or cuneate at base, on slender petioles mostly as long or longer than the blade: stipules broad, obtuse, about an inch long: submerged leaves linear-lanceolate, 1-2 inches long, 1-3 lines wide, acute or acuminate, narrowed at base: spikes about an inch long, rather loose, on stout often elongated peduncles: fruit round-obovate, a line long, acute, scarcely keeled: embryo stout, incurved. In different forms throughout most parts of North America: also in Europe.

* * Leaves all submerged and uniform, thin and dilated, numerous, mostly sessile: spikes dense, on stout peduncles.

P. prælongus Wulf. in Rœm. Arch. iii, 331. Stems stout, elongated, branching and flexuous above, usually growing in deep water, sometimes 8 feet long: leaves often lanceolate, 2-10 inches long, 6-12 lines wide, obtuse and somewhat cucullate at the apex, rounded and clasping at base, undulate-serrate: stipules white and conspicuous, 6-12 lines long: peduncles often much elongated: fruit semicircular, 2 lines long, acutely keeled, prominently beaked: embryo slender, the cotyledons pointing to the base of the radicle. In deep water, Brit. Columbia to California and the Eastern States.

P. perfoliatus L. Sp. 126. Stems slender, not flexuous, 2-4 feet high, branching: leaves broadly cordate to cordate-lanceolate, 6-18 inches long, obtuse to acute, clasping at base: stipules small and not persistent: spikes 8-12 lines long, often flowering and fruiting under water: fruit obliquely obovoid, nearly $1\frac{1}{2}$ lines long, obtusely keeled, beaked by the short slender style: embryo slightly incurved or with the apex pointing directly toward the base. In streams and ponds, California to Brit. Columbia and across the continent.

Var. Richardsonii A. Bennett Britten's Journ. Bot. xxvii, 25. Leaves 1-5 inches long, 4-8 lines wide at the broadened amplexicaul base, often curved inward at the apex, 13-23-nerved: fruit about 2 lines long, $1\frac{1}{4}$ lines thick. In streams and ponds, Oregon to California and Delaware.

P. zosteræfolius Schum. Enum. Pl. Saell. 50. Stems much flattened,

sometimes winged, widely branching: leaves linear: mucronate or short-pointed at the apex, 2-12 inches long, 1-2 lines wide, with 3 principal nerves and many fine ones: stipules scarious, finely nerved, soon perishing: peduncles $1\frac{1}{2}$ -4 inches long: spike cylindric, about $\frac{1}{2}$ inch long, 12-15-flowered: fruit obovoid with a broad base, about 2 lines long, 3-keeled on the back, the lateral keels rather obscure, beaked with a short recurved style: embryo slightly incurved. In still or running water, Oregon to New Jersey and New Brunswick: also in Europe.

P. foliosus Raf. Med. Rep. (11) v, 354. Stems flattened, much branched, 1-3 feet long: leaves 1-2 inches long, $\frac{1}{2}$ -1 line wide, acute, 3-nerved, mostly glandular at base: stipules white, hyaline, obtuse to acute, 6-10 lines long: peduncles more or less clavate, erect, about 6 lines long: spikes about 4-flowered, fruit lenticular or nearly orbicular, about 1 line in diameter, 3-keeled on the back, the middle keel winged and sinuate-dentate, the face strongly angled or arched, sharp, often with a projecting tooth at base: style apical. In ponds and streams, California to Brit. Columbia, and New Brunswick.

Var. Californicus Morong Bot. Gaz. x, 254. Stems stout and bushy, strongly flattened and sometimes winged, thickly clustered: leaves smaller, with dilated midrib and frequently 5-nerved at base: peduncles 4-6 lines long, erect, clavate, flattened: spikes often ripening 12 strongly marked fruits. Eastern Oregon to southern California.

P. pusillus L. Sp. 127. Stems filiform, branching, 6-24 inches long: leaves narrowly linear, 1-3 inches long, rarely a line wide, often nearly setaceous, 1-3-nerved, obtuse and mucronate or acute, biglandular and sessile: stipules obtuse, becoming setose: spike capitate or somewhat elongated and open or interrupted, on slender flattened peduncles $\frac{1}{2}$ to nearly 2 inches long: fruit obliquely ellipsoidal, about a line long, 2-grooved on the back or sometimes with 3 distinct keels: apex of the embryo slightly incurved and pointing obliquely downward. In ponds, Brit. Columbia to California and across the continent: also in Europe.

+ + Stipules united with the sheathing base of the leaf: spikes interrupted.

P. pectinatus L. Sp. 127. Stems slender, repeatedly branched, 1-3 feet long: leaves setaceous, attenuate to the apex, 1-nerved, 1-6 inches long, often capillary and nerveless: stipules half free, 6-12 lines long, thin: sheaths scarious on the margins: peduncles filiform, 2-12 inches long, the flowers in verticils: fruit obliquely obovoid, with a broad thick shell, 1-2 lines long, plump on the sides: apex of the embryo pointing almost directly toward the basal end. In ponds and brackish or salt water, Brit. Columbia to California and the Eastern States.

P. Robbinsii Oakes Hovey's Mag. vii, 180. Stems stout, widely branching, 2-4 feet long: leaves linear, 3-5 inches long, acute, finely many-nerved, crowded in 2 ranks, minutely serrulate, auriculate at the point of attachment with the obtuse at length setose stipules: spikes usually several, on stout peduncles about an inch long, loose and more or less interrupted, about 6 lines long: fruit oblong-obovoid, nearly 2 lines long, keeled with a broadish wing, acutely beaked: embryo stout, the apex pointing a little inside of the basal end. In ponds and lakes, Oregon to California and the Atlantic States.

ORDER CV SCHEUCHZERIAACEÆ Agardh Theor. Syst. Pl. 44.

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1 *Triglochin* Leaves all radical: flowers bractless, in a spike-like raceme terminating a jointless scape: ovaries 3-6, united until maturity.

2 *Scheuchzeria* Flowers bracteate in a loose raceme upon a leafy stem: ovaries 3, nearly distinct, at length divergent.

1 TRIGLOCHIN L. Sp. 338.

Perennial herbs with all radical terete or semiterete ligulate leaves with membranous sheaths, and perfect flowers in a naked raceme upon a scape-like peduncle. Perianth herbaceous, deciduous, of 8 small concave sepals and as many similar petals. Stamens 3 or 6, with oval nearly sessile anthers. Ovaries 3-6-celled with sessile stigmas and solitary ovules, separating at maturity from the central axis into as many distinct carpels. Seeds anatropous, erect, with membranous testa. Embryo straight, with minute included plumule.

T. maritima L. Sp. 339. Rootstock without stolons, often scabrous, the caudex thick, mostly covered with the sheaths of former leaves: scapes stout, nearly terete, $\frac{1}{2}$ -2 feet high: leaves semiterete, usually about 1 line wide, shorter than the scape: raceme elongated, often 18 inches or more long: pedicels decurrent, 1-1 $\frac{1}{2}$ lines long: segments of the perianth 6, each with a large sessile anther at its base: pistil of 6 united carpels: fruit oblong or ovoid, 2 $\frac{1}{2}$ -3 lines long, obtuse at base, with 6 recurved points at the summit: carpels 3-angled. In saltmarshes and saline places, California to Alaska and across the continent: also in Europe.

T. palustris L. Sp. 338. Rootstock short, oblique, with slender fugaceous stolons: leaves linear, shorter than the scapes, 5-12 inches long, tapering to a sharp point: scapes striate, 8-20 inches high: racemes 5-12 inches long: pedicels capillary, in fruit erect-appressed, 2 $\frac{1}{2}$ -3 lines long: perianth segments 6, greenish-yellow: anthers 6, sessile: pistil of 3 united carpels: stigmas sessile: fruit linear or clavate: ripe carpels separating from the axis and becoming suspended from its apex, the axis 3-winged. In bogs, Idaho to Alaska and the northern Atlantic States: also in Europe.

2 SCHEUCHZERIA L. Sp. 338.

Bog perennials with creeping rootstocks, erect leafy stems flatish leaves and small flowers in a loose terminal raceme. Perianth of 3 oblong sepals and 3 narrower petals. Stamens 6, with linear-oblong anthers and slender exerted filaments. Ovary of 3 nearly distinct ovoid 1-2-ovuled carpels, becoming divergent coriaceous subglobose follicles, dehiscing ventrally. Stigmas flat, sessile. Seed ascending, anatropous, with coriaceous testa. Embryo straight, thick.

S. palustris L. Sp. 338. Stems solitary or several together, usually clothed at the base with the remains of old leaves, 4-10 inches high: leaves 5-15 inches long, exceeding the stem, the uppermost reduced to bracts: pedicels 3-10 lines long, spreading in fruit: flowers white, few, in a loose terminal raceme: segments of the perianth membranaceous, 1-nerved, 1 $\frac{1}{2}$ lines long: filaments 2-4 lines long: seeds oval, brown, 2 $\frac{1}{2}$ -3 lines long,

with a very hard coat. In cold bogs, California to Alaska and across the continent: also in Europe and Asia.

ORDER CVI ALISMACEÆ DC. Fl. France iii, 181.

Marsh herbs with scape-like stems, broad leaves with sheathing base and conspicuous perfect or unisexual flowers in panicles or racemes. Perianth of 3 herbaceous persistent sepals and as many often conspicuous white deciduous sepals. Stamens 6 or more, included. Ovaries numerous, distinct, 1-celled and mostly 1-ovuled, becoming achenes in fruit. Seed erect, campylotropous, with membranous testa and no albumen. Embryo strongly recurved or uncinat.

- 1 *Alisma* Flowers perfect: stamens usually 6: carpels numerous, verticillate, distinct, obovate-oblong.
- 2 *Sagittaria* Flowers monoecious or dioecious: carpels numerous, flattened and membranously winged.

1 ALISMA L. Sp. 342.

Perennial herbs growing in shallow water or mud with broad leaves and small flowers in a verticillately branched panicle. Flowers perfect, small, numerous, on unequal 3-bracteolate pedicels. Stamens 5, rarely more, with short filaments. Ovaries distinct, numerous, borne in several whorls on a small flat receptacle, 1-ovuled. Styles very short, ventral. Achenes in a crowded whorl, ovate-oblong, flattened.

A. *Plantago-aquatica* L. Sp. 342. Scape $\frac{1}{2}$ -3 feet high, usually solitary: leaves ovate, acute at the apex, cordate, rounded or narrowed at base, or when floating sometimes lanceolate or even linear, on petioles 1-10 inches long: inflorescence a large loose panicle 5-15 inches long: pedicels verticillate in 3's-10's, subtended by 3 striate acuminate bracts: petals $\frac{1}{2}$ -1 line long: styles deciduous, the base remaining as a small point or short beak on the inner curve of the achenes: stigmas small, terminal: achenes nearly 1 line long, arranged in a circle forming an obtusely triangular truncate head. In shallow water or mud, throughout North America: also in Europe and Asia.

2 SAGITTARIA L. Sp. 993.

Perennial aquatic or bog herbs with broadly sheathing leaves, often without blades, and mostly simple stems bearing one to few whorls of flowers mostly in threes. Flowers monoecious or sometimes dioecious, the staminate ones above. Petals usually conspicuous. Stamens usually numerous, inserted on the convex receptacle: anthers 2-celled, dehiscent by lateral slits. Pistillate flowers with numerous distinct ovaries. Stigmas small. Achenes numerous, densely aggregated in subglobose heads.

S. *arifolia* Nutt. J. G. Smith Ann. Rep. Mo. Bot. Garden vii, 32.

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Garden vii, 32.

pl. 1. Glabrous or nearly so, terrestrial or partly submerged: scapes weak, ascending, 8-20 inches high: leaves sagittate, long-petioled, the blade 3-10 inches long, acute, the lobes divergent, acute or acuminate: bracts lanceolate, acute, 4-10 lines long, scarious-margined and obscurely veined, often reflexed: 1-3 lower verticils pistillate: fruiting heads 4-8 lines in diameter: achenes a line long, tumid, winged on both margins. Along streams and borders of lakes, Brit. Columbia to California and Minnesota.

Var. striata J. G. Smith Ann. Rep. Mo. Bot. Gard. vi, 8. Slender, erect, 12-16 inches high: blade of leaf 1-3 inches long: scape simple: bracts ovate, acute, 3-4 lines long: fruiting heads 6 lines in diameter: achenes smooth or laterally unicostate. Boggy meadows and slow streams, Falcon Valley, Washington.

S. cuneata Sheldon Bull. Torr. Bot. Club xx, 289, pl. 159. Submerged aquatic, rooting in the mud: leaves sagittate, long-petioled, the blade floating, 3-4 inches long, with linear lobes: scapes simple, slender, terete, 2-3 feet long, bearing verticils of flowers at the surface of the water: bracts ovate-lanceolate, acute, 2-3 lines long: stamens few: fruiting heads small, about 6 lines in diameter: achenes $\frac{1}{2}$ line long. In ponds or on margins of lakes, Brit. Columbia to Washington and Minnesota.

S. esculenta. *S. variabilis* Engelm. in part. (WAPATOO). Glabrous or nearly so: scapes simple or branched, 1-3 feet high: leaves large, the blade 4-12 inches long, obtuse or abruptly acute, the lobes from lanceolate to broadly ovate, acuminate, divaricate: bracts scarious, 3-5 lines long, ovate, obtuse: achenes about 3 lines long, with rather tumid dorsal wing and long, horizontal beak. In shallow lakes, Brit. Columbia to California: this species was very abundant along the lower Columbia river, but is now almost exterminated by the Carp.

ORDER CVII JUNCACEÆ Vent. Tabl. ii, 150. (1799.)

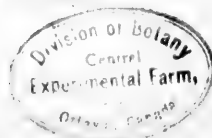
Mostly perennial herbs, caespitose or with creeping rhizomes, terete hollow or spongy usually simple stems, alternate sheathing flat, channelled or terete leaves and small usually sessile scarious bracteolate flowers in panicles, cymes, subumbellate clusters or spicate heads. Flowers perfect, with a regular persistent perianth of 6 similar glumaceous segments in two rows, 3-6 nearly hypogynous included stamens with persistent filiform filaments and 2-celled anthers, and a superior 3-celled ovary, or sometimes one-celled with 3 parietal placentæ, with three or many anatropous ovules. Styles very short, with three filiform stigmas. Capsule loculicidally 3-valved. Seeds with membranous or cellular often caudate or appendaged testa. Embryo minute, enclosed within the base of fleshy albumen.

- 1 **Juncoides** Stems leafy, hollow: leaves flat and soft, often villous: capsule 1-celled, with 3 parietal 1-seeded placentæ.
- 2 **Juncus** Stems usually with spongy pith: leaves terete or flat, not villous.

1 JUNCOIDES Adans. Fam. Pl. ii, 47. (1763.)

LUZULA DC. Fl. Fr. iii, 47. (1805.)

Perennial herbs with simple hollow leafy stems, grass-like flat leaves and numerous small flowers in loose involucrate umbels or panicles, or more or less densely clustered or spicate. Floral



bracts small and scarious. Stamens always 6. Capsule 1-celled, with 3 parietal placentæ and 1-3 erect seeds.

J. pilosum Kuntze Rev. Gen. ii, 725. Tufted, often somewhat stoloniferous: stems erect, 2-4-leaved, 6-12 inches high: radical leaves 2-6 inches long, 2-4 lines wide, slightly pubescent, acuminate into a blunt almost gland-like point: cauline leaves similar but successively shorter: inflorescence an umbel-like cluster, the filiform pedicels usually nearly equal, 1-2-flowered: perianth 1-1½ lines long, its segments triangular-ovate, acuminate, brown with hyaline margins, almost twice as long as the toothed bractlets: capsule about ¼ longer than the perianth, its valves ovate-lanceolate: seeds about 1 line long, with a conspicuous hooked caruncle at the summit. Oregon to Alaska and in the Alleghany Mountains: also in Europe and Asia.

J. spadicum Kuntze l. c. 724. Glabrous or slightly villous: stems 6-18 inches high: leaves 4-6 inches long, 3-5 lines wide, acute or shortly acuminate: inflorescence lax, and drooping, much exceeding the usually small involucre bracts: perianth straw-color or tinged with brown, the segments lanceolate, acuminate, about 1 line long, slightly shorter than the acute apiculate capsule: seeds oblong, brownish, not appendaged. In the mountains, California to the Arctic regions and the northern Atlantic States: also in Europe.

J. parviflorum Coville Cont. Nat. Herb. iv, 209. Stems slender, tufted, 1-2 feet high: leaves narrowly lanceolate, 3-6 inches long: 3-6 lines wide: inflorescence a loose decompound panicle, commonly 3-4 inches high, its lowest bract foliaceous, seldom more than ¼ the length of the panicle: flowers borne singly or 2-3 together on the branches of the panicle, on slender pedicels: bractlets ovate: perianth ¾-1¼ line long, its segments ovate, acuminate, slightly exceeded by the green to brown ovoid capsule: seeds narrowly oblong, attached to the placentæ by a slender fibre. In forests, Alaska to California and the northern Atlantic States.

Var. melanocarpum Sheldon Bull. Geol. Surv. Minn. ix, 63. Stems stouter and shorter: leaves more numerous, and somewhat broader: inflorescence more dense: bracts all scarious: pedicels 3-6 lines long: perianth and capsule dark brown. On the highest parts of the Cascade Mountains.

Var. subcongestum Sheldon l. c. Often tufted: leaves narrower: inflorescence more narrowly paniculate: pedicels only a line or two long, the flowers thus appearing in small heads. In the high mountains, Alaska to California.

J. spicatum Kuntze l. c. 725. Closely tufted, without rootstocks: stems erect, 4-16 inches high, distantly 1-3 leaved tapering to a filiform summit: leaves 2-3 lines wide, often involute, tapering to a sharp apex: inflorescence a nodding spike-like often interrupted panicle, commonly 9-15 lines long, usually exceeded by the lowest leaf-like bract, ovate-lanceolate, acuminate, equalling the perianth: segments of the perianth brown with hyaline margins, 1-1½ lines long, lanceolate, aristate-acuminate: capsule broadly ovoid, about ¾ as long as the perianth: seeds narrow and obliquely obovoid. Alaska to California and across the continent.

J. comosum Sheldon l. c. 64. Stems slender, 6-15 inches high, leafy, leaves 3-4 inches long, 1-3 lines wide, the foliaceous bract usually exceeding the narrow panicle: peduncles 2-12, unequal, the longer 1-3 inches long spikes simple, usually oblong, loosely-flowered: perianth pale or somewhat tinged with brown, about 1½ lines long, its segments narrowly acuminate equalling the obtuse capsule: anthers small, as long as the filaments: seed, dark brown with a white caruncle, appendage sometimes half as long as the seed. Alaska to California and the Rocky Mountains.

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Var. congestum Sheldon l. c. Spikes several, sessile and close, forming a somewhat pyramidal head: bracts white and conspicuous: perianth brown, $1\frac{1}{2}$ lines long. Near the coast, Oregon to California.

Var. macranthum Parish. Perianth 2-3 lines long, much exceeding the broad obtuse capsule: anthers equalling or twice longer than the filaments: seeds longer, the appendage always short. Alaska to California.

Var. subsessile Watson Bot. Cal. ii, 203, under *Luzula*. Spikes solitary or few, nearly sessile, loose: perianth-segments lax and scarious. Oregon to California.

J. campestre Kuntze l. c. 724. More or less villous with long white hairs: stems densely tufted, erect, 4-10 inches high, 2-4-leaved: leaves 2-5 inches long, 1-4 lines wide, tapering at the apex to a blunt almost gland-like point: branches of the panicle unequal, straight, each bearing an oblong or short-cylindric dense spike: the lowest bract leaf-like, often exceeding the panicle: floral bracts white, ovate, acuminate, about equaling the flowers: segments of the perianth lanceolate-ovate, acuminate, brown with white margins, $1-1\frac{1}{2}$ lines long: capsule obovoid: seeds oblong, with a thick white appendage at base. In the mountains, Alaska to California and the Eastern States.

J. divaricatum Coville l. c. Stems 4-7 inches high: cyme broadly diffuse, with divaricately spreading branches and pedicels: perianth tinged with brown: seed light-colored, with a small appendage at base. In the Cascade and Sierra Nevada Mountains, southern Oregon to California.

2 JUNCUS L. Sp. 325.

Glabrous perennial or annual plants, growing in wet or moist places, with simple terete leafy or leafless stems, terete channelled or flat, sometimes equitant, often knotted leaves and small flowers in clusters, cymes, panicles or heads or solitary. Stamens 6, or sometimes 3 by suppression of the inner ones. Capsule globose to pyramidal, many-seeded, 3-valved, 3-celled with central placentæ, or 1-celled with parietal placentæ. Seeds usually distinctly reticulated or ribbed, often tailed.

* Stems leafless and scape-like, from matted rootstocks, sheathed at base: the inner sheaths sometimes bearing terete leaves: flowers in sessile apparently lateral panicles.

+ Scapes slender: sheaths mostly leafless: spathes usually very much exceeding the panicle: stamens usually 6.

-- Flowers in compound panicles, two lines long or more: capsule oblong-ovate.

J. Lescurii Bolander Proc. Calif. Acad. ii, 179?. Stems stout, 1-3 feet high, from a stout creeping rhizome: sheaths short, black, obtuse: spathe 6-15 inches long very acutely pointed: flowers in a dense somewhat secund many-flowered panicle: bracts ovate, acuminate: perianth-segments $2\frac{1}{2}$ -3 lines long, lanceolate, acuminate: greenish-white with intermarginal brown stripes: anthers much longer than the filaments: capsule brown, triquetrous, sharply angled, acute, shorter than the perianth: seeds ovate, obtuse, scarcely apiculate. In shifting sands along the coast of Oregon: perhaps distinct from *J. Lescurii* as that species is said to grow in "Salt-marshes and saline localities".

J. Batticus Willd. Berlin Mag. iii, 298. Stems erect, 8-36 inches high, arising at intervals from stout creeping rootstocks: sheaths green or tinged with dark brown: spathes slender, 4-6 inches long: panicle commonly

loosely branching 1-3 inches long: perianth $1\frac{1}{2}$ - $2\frac{1}{2}$ lines long its segments lanceolate, acute, or the inner sometimes obtuse, brown with green midrib and hyaline margins: stamens 6, about $\frac{3}{4}$ the length of the perianth: anthers much longer than the filaments: capsule about as long as the perianth, pale to dark brown, narrowly ovoid, conspicuously mucronate: seeds usually with a loose coat. On shores of lakes and streams, Alaska to California and across the continent: also Europe and Asia.

• • Flowers in compound panicles, smaller: capsule obovate or subglobose.

J. effusus L. Sp. 326. Pale green or yellowish: stems densely tufted, 3-4 feet high, from stout branching proliferous rootstocks: sheaths short or mere rudiments: spathe short, often not exceeding the erect, loosely flowered panicle: perianth $1-1\frac{1}{2}$ lines long, its segments green, lanceolate, acuminate: stamens 3, the anthers shorter than the filaments: capsule obovoid, 3-cleft, obtuse or retuse: seeds apiculate, finely ribbed, about $\frac{1}{4}$ line long. Common in swamps and wet places in most parts of the world.

Var. Brunnescens Engelm. Panicle usually very short and compact: perianth and capsule dark brown. Near the coast, Oregon to California.

J. patens Meyer Rel. Hænk. i, 141. Densely tufted, pale green: stems slender, 1-3 feet high: sheaths few, 1-4 inches long, acute: spathe slender, 4-6 inches long: panicle small, often compact and somewhat secund: perianth pale to light brown, its segments lanceolate, acuminate, about $1\frac{1}{2}$ lines long: stamens 6, the anthers shorter than the filaments: capsule subglobose, slightly angled, equalling or a little shorter than the perianth, with thin septa, the valves breaking away from the central placentæ. In wet places, Oregon and Washington to California.

J. filiformis L. Sp. 326. Stems slender, 4 inches to 2 feet high many of them sterile and appearing like leaves, from stout matted rootstocks: sheaths purplish, obtuse, with a short bristle-like appendage: spathe usually longer than the stem: panicle rather few-flowered, 6-12 lines high: segments of the perianth $1\frac{1}{4}$ - $1\frac{1}{2}$ line long, green with hyaline margins, narrowly lanceolate, acuminate: stamens 6, about half the length of the perianth: anthers shorter than the filaments: capsule obovoid, green, barely pointed, about $\frac{3}{4}$ as long as the perianth, 3-celled: seeds oblong, about $\frac{1}{2}$ line long, pointed, at each end. In marshes, Washington to Alaska and across the continent.

+ Low alpine perennials: flowers 1-3: stamens 6.

J. Drummondii E. Meyer Ledeb. Fl. Ross. iv, 235. Cespitose: stems very slender, 10-16 inches high: sheaths green, obtuse, the inner ones bristle-tipped: spathe filiform, 6-12 lines long, equalling or exceeding the usually 3-flowered panicle: perianth-segments about 3 lines long, green with brown margins, lanceolate, acute, or acuminate: anthers a little longer than the filaments: capsule brown, oblong, retuse, nearly equalling the perianth: seeds a line long, ovate, caudate, very finely striate. On the highest mountains, California to Unalaska and the Rocky Mountains.

J. Parryi Engelm. Trans. St. Louis Acad. ii, 446. Cespitose: stems filiform, 3-10 inches high: inner sheaths leaf-bearing, the leaves sulcate at base, terete above, much shorter than the stems: spathe longer than the inflorescence, 6-18 lines long: panicle loosely 1-3-flowered: perianth-segments 3 lines long or more, more or less tinged with brown, lanceolate, acuminate, or the inner obtuse: anthers much longer than the filaments: capsule oblong, acute, about equalling the perianth: seeds ovate, caudate, a line long, finely striate. On grassy slopes on the highest mountains, Brit. Columbia to California and the Rocky Mountains.

J. castaneus Smith Fl. Brit. i, 383. Stems erect, 4-20 inches high,

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leafy, from slender rootstocks: leaves terete, deeply channelled at base: spathe longer than the inflorescence: heads 1-3, 3-12 flowered: perianth-segments brown or black, 2-4 lines long, lanceolate, acute: anthers pointed, half as long as the filaments: capsule brown, longer than the perianth, narrowly oblong, tapering to an acute summit, imperfectly 3-celled: seeds with long slender tails, the body about 3/4 line long. Oregon to Alaska and across the Continent.

* * Stems leafy at base: leaves flat or semiterete, not knotted: panicle or head evidently terminal: the spathe usually short.

+ Dwarf or low slender annuals with fibrous roots: stems leafy, branched.

J. bufonius L. Sp. 328. Stems usually branching from the base, 1-12 inches high: leaves very narrow, usually revolute and bristle-like: flowers greenish, mostly remote and secund upon the spreading branches: perianth-segments lanceolate, acuminate, with scarious margins, 2-3 lines long, the inner slightly shorter: stamens 6; anthers about as long as the filaments: capsule oblong, obtuse, shorter than the perianth: seeds ovate, obtuse, very finely striate and cross-lined. A common species everywhere, growing in places that are wet in spring.

J. triflorus Engelm. l. c. 402. Stem very short or almost none, bearing several erect filiform scape-like peduncles 1-3 inches long: leaves an inch long or less, filiform, channelled, flat above: flowers usually 3-7, in a small head: perianth brownish, its segments narrowly lanceolate, acuminate, 1-1 1/4 lines long, a little longer than the 3 stamens and the obtuse apiculate capsule: style exserted, with elongated stigmas: seeds ovate, obtuse, finely ribbed and cross-lined. In barren places that are wet in spring, western Oregon to California.

Var. brachystylus Engelm. l. c. Smaller, the peduncles 1-3-flowered: stamens half the length of the perianth; the oblong anthers shorter than the filaments: style and stigmas short, included. With the type.

Var. uniflorus Engelm. l. c. Very small, only half to an inch high, the solitary flowers mostly dimerous. Oregon to California.

+ + Taller perennials: stems simple: stamens 6.

.. Stems naked: flowers solitary in a diffuse or compact panicle,

J. tenuis Willd. Sp. Pl. 214. Stems slender, erect, 1-2 feet high, leafy at base: leaves very narrow, flat or more or less channelled or involute, shorter than the stem: spathe exceeding the inflorescence: panicle usually loose and spreading: perianth-segments pale, narrowly lanceolate, acuminate, 1 1/2-2 lines long, spreading in fruit and equalling or exceeding the ovate retuse greenish capsule: seeds white-appendaged at each end, very finely ribbed and cross-lined. In dry or moist soils, throughout most parts of North America.

J. occidentalis Weigand Bull. Torr. Bot. Club xxvii, 521. *J. tenuis* var. *congestus* Engelm. Stems stiff and erect, 1-2 feet high, pale green, nearly terete: leaves 1/2-1/2 the length of the stem, flat and flexuous: spathe 2-3 inches long, exceeding the inflorescence: panicle glomerate, or more commonly somewhat open, fuscous: perianth-segments broadly subulate, fuscous with green midrib and rather broad scarious margins: stamens about half as long as the perianth, the oblong anthers much shorter than the filaments: capsule oblong-ovoid, obtuse or retuse, 1/4 as long as the perianth, fuscous, the placenta extending only about half-way to the axis: seeds oblong, irregularly apiculate at each end areolate-reticulated, not striate. Along ditches and in wet places, Oregon to California.

J. confusus Coville Proc. Biol. Soc. of Wash. x. 127. Densely tuft-

ed, 7-30 inches high, erect: sheaths of the leaves with well developed ligules, the blades about $\frac{1}{2}$ the length of the stem, flat, usually involute: spathe much longer than the inflorescence, usually involute: panicle congested into a turbinate cluster, an inch long: perianth-segments ovate-lanceolate, acute, brown with green midrib: stamens 6, the anthers shorter than the filaments: capsule oblong, equalling the perianth, retuse, completely 3-celled: seeds light brown. In meadows, eastern Washington to Montana and Colorado.

** Stems more or less leafy; the leaves flat and grass-like, not equitant: flowers clustered.

J. falcatus E. Meyer Reliq. Hænk. 144. Bright green: stems slender, 6-18 inches high, from slender stoloniferous rootstocks: leaves usually equalling or exceeding the stem, 1-2 lines wide, the open somewhat oblique sheaths without ligules: spathe short: heads usually 1-5, 1-10-flowered: perianth-segments brown with bright green midrib, 2-3 lines long, ovate, the outer shortly acuminate, the inner obtuse: anthers much shorter than the filaments: capsule ovate, obtuse, apiculate, as long or longer than the perianth, almost black, 3-celled: seeds oblong-ovate, obtuse, $\frac{1}{4}$ line long, with loose pale testa, longitudinally reticulated. In springy places along mountain streams, California to Alaska.

J. longistylis Torr. Bot. Mex. Bound. Surv. 223. Stems rather stout, 1-2 feet high, from stout stoloniferous rootstocks: leaves 6-12 inches long, the sheaths with distinct ligules: spathe narrow, 2-4 inches long: heads 5-20, in a sparingly branched panicle, few- to several-flowered: perianth-segments pale brown with green midrib and hyaline margins, about 3 lines long, lanceolate, acute or the outer ones acuminate: anthers much longer than the filaments: style about a line long: capsule brown, oblong, about half as long as the perianth, angled above, obtuse or depressed at the summit, 3-celled: seeds light brown, $\frac{1}{4}$ line long. In wet places. Washington to California.

*** Leafy-stemmed perennials: leaves terete or laterally flattened, more or less distinctly knotted by internal partitions: flowers capitate.

+ Leaves terete or only slightly compressed.

J. Richardsonianus Schult. in R. & S. Syst. vi, 201. Stems erect, 6-20 inches high, in loose tufts from creeping rootstocks, 1-2-leaved below the middle: panicle 3-8 inches high, its branches strict or slightly spreading: heads 3-12-flowered: perianth-segments unequal, the outer ones pale, obtuse, mucronate or acute; the inner ones shorter, obtuse, stamens 6; the anthers much shorter than the filaments: capsule ovoid-oblong, slightly exceeding the perianth, acute or obtuse, with a short tip: seeds about $\frac{1}{4}$ line long, narrowly obovoid to oblong, apiculate, acute or acuminate at base. Idaho to Brit. Columbia and across the Continent.

J. dubious Engelm. l. c. 459. Stems rather stout, 2-4 feet high, from stout horizontal rootstocks, several-leaved: leaves narrow, often equalling or exceeding the stem, the sheaths with scarious margins: panicle compound, diffuse, 3-12 inches long: heads numerous, 6-20-flowered: perianth-segments brown or brownish, about 2 lines long, lanceolate, acuminate: stamens 6, the anthers elongated, longer than the filaments: capsule narrow, acuminate, shorter than the perianth: seeds ovate, rather abruptly acuminate at each end, brownish. In marshes, Oregon to California.

J. nodosus L. Sp. 466. Stems slender, 6 inches to 2 feet high, arising singly from tuber-like thickenings of a slender rootstock: leaves narrow, the upper one often exceeding the inflorescence: panicle 1-3 inches long, bearing 1-30 spherical 8-20-flowered heads: perianth-segments usually reddish-brown above, lanceolate, acuminate, $1\frac{1}{3}$ - $1\frac{2}{3}$ line long, the inner

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J. O. very slender: very slender: proliferous: with an: cronate, In bog,

J. Bo. leaves: times elongated: flowered: setaceous: than the: obtuse, Oregon to

J. Ne. 2 feet high: very narrow: sheaths: short open: late, acuminate: filaments: the perianth: mountain

J. Su. a foot high: erect ones: conspicuous: shining, narrowly: the filaments: 3-angled.

J. bra. stiff, erect: conspicuous: blade, usually: line wide: ligule: 2½ lines: about as long: above, obtuse: strongly angled

J. latif. leaves flat:

longest: stamens 6, with anthers about as long as the filaments: capsule lanceolate-subulate, 3-angled, 1-celled, exceeding the perianth: seeds oblong, acute below, apiculate above. Alaska to Oregon and the Eastern States,

J. Torreyi Coville Bull. Torr. Bot. Club xxii, 303. Stems stout, 8-40 inches high, arising singly from tuber-like thickenings of a slender rootstock: leaves terete, thick, abruptly divergent from the stem: inflorescence congested, consisting of 1-20 dense heads 5-8 lines in diameter: perianth-segments 2-2½ lines long, subulate, the outer longest: stamens 6: capsule subulate, 3-angled, 1-celled, with a beak ¼-¾ line long, exceeding the perianth and holding the valves together during dehiscence: seeds oblong, acute at each end. Oregon to California, Texas and New York.

J. Oreganus Watson Proc. Am. Acad. xxiii, 267. Stems numerous, very slender, 6-10 inches high, exceeding the very narrow leaves, from very slender matted rootstocks: heads simply panicled, few-flowered, often proliferous: perianth-segments nearly equal, lanceolate, acute: stamens 6, with anthers as long as the filaments: capsule dark brown, acutish, mucronate, at length nearly twice as long as the perianth: seeds rather turgid. In bogs, Ilwaco, Washington.

J. Bolanderi Engelm. l. c. 470. Stems slender, about 2 feet high: leaves subterete, nearly equalling the stem; the ligule conspicuous, sometimes elongated and leaf-like: heads subglobose, usually 2 or 5, very many-flowered: perianth-segments greenish brown, narrowly lanceolate and setaceously acuminate, 1½ lines long: stamens 3, with anthers much shorter than the filaments: capsule clavate-oblong, shorter than the perianth, obtuse, apiculate, 1-celled: seeds very small. In wet places southwestern Oregon to California,

J. Nevadensis Watson l. c. xiv, 303. Stems very slender, 6 inches to 2 feet high, somewhat compressed, from slender creeping rootstocks: leaves very narrow, somewhat compressed nearly equalling the stem, with large sheaths and conspicuous ligules: heads small, few to rather many, in a short open panicle, or often solitary: perianth-segments brownish, lanceolate, acuminate, 2 lines long: stamens 6; anthers linear, longer than the filaments: capsule oblong, abruptly acute and beaked, nearly equalling the perianth: seeds minute, apiculate at both ends. Common in wet mountain meadows, eastern Washington to California and Nevada.

J. Saksdorfii Rydberg Bull. Torr. Bot. Club xxvi, 541. Stems about a foot high, strict, light green: leaves terete or slightly flattened, the lowest ones short: cauline except the upper one often a foot long, all with conspicuous scarious sheaths: heads in a contracted panicle, brown and shining, 2-8-flowered: perianth-segments subequal, about 2 lines long, narrowly lanceolate, acute or acuminate, stamens 6; anthers longer than the filaments: capsule dark brown and shining, oblong, acuminate, 3-angled. In wet meadows about the base of Mount Adams, Washington.

J. brachyphyllus Weigand Bull. Torr. Bot. Club xxvii, 519. Stems stiff, erect and very stout, 20-30 inches high, slightly compressed, very conspicuously grooved: leaves short, ¼-½ the length of the stem, the blade, usually broad and flat but rather thick, stiff and spreading, about a line wide; sheaths loose and mostly free, with membranous margins; ligule conspicuous: inflorescence short and crowded: perianth-segments 2½ lines long, slightly unequal, subulate, very acute: anthers oblong, about as long as the filaments: capsule rather narrowly oblong, triangular above, obtuse or retuse, equalling the perianth, 3-celled: seeds oblong, strongly apiculate at each end. Idaho to Arkansas.

J. latifolius Buch. Stems 15-36 inches high, from creeping rootstocks: leaves flat, about a line wide, pale green, shorter than the sheaths, with

ligules: heads paniced few-flowered: perianth-segments straw-color, lanceolate, acuminate, scarious-margined, rough, 3 lines long: stamens 6: capsule triangular, oblong, acute, short-beaked. Common along streams, eastern Washington.

+ + Stems compressed and usually acutely edged: leaves flattened laterally and equitant.

J. ensifolius Wiks. Stems 8-20 inches high, leafy, from thick rootstocks: leaves equitant: heads several to numerous, paniced, globose, usually dark brown: perianth-segments lanceolate, acuminate $1\frac{1}{2}$ lines long: stamens 3: capsule 3-angled, acute, hardly exceeding the perianth. Common in wet places Brit. Columbia to California.

J. xiphioides Meyer l. c. Stems rather stout, 1-4 feet high, from stout creeping rootstocks: leaves 2-3 lines wide, the sheaths without ligules: heads few to numerous, dense, 3-20-flowered, in a compound panicle: perianth-segments brownish to almost black, $1\frac{1}{2}$ lines long, lanceolate, acuminate: stamens 6; anthers very small oblong-linear, equalling or much shorter than the filaments: capsule oblong, acute, about-equalling the perianth: seeds very small, ovate-oblancoate. A variable species: in wet places, California to Alaska.

J. oxymertis Engelm. l. c. 483. Stems stout, 2-4 feet high: leaves 2-3 lines wide: panicle decompound, 4-8 inches long: heads small, very numerous, 3-12-flowered: perianth-segments linear-lanceolate, acuminate-awned, about 2 lines long: stamens 6; anthers twice as long as the filaments: capsule lanceolate, rostrate, longer than the perianth, 1-celled: seeds ovate-oblancoate, $\frac{1}{4}$ line long. In marshes, southern Oregon to California.

J. Mertensianus Bong. Veg. Sitch. 167. Stems weak, 6-18 inches high, from matted rootstocks: leaves usually about a line wide; ligule conspicuous: inflorescence usually a single many-flowered head, 4-6 lines in diameter: perianth-segments very dark brown, ovate-lanceolate, the outer ones aristate-acuminate: stamens 6; anthers usually mucronate, as long or shorter than the filaments: capsule obovate, obtuse, about equal, equalling the perianth: seeds oblancoate, apiculate at each end. In wet meadows on the highest mountains, California to Alaska and the Rocky Mountains.

ORDER CVIII CYPERACEÆ J. St. Hil. Expos. Fam. i, 62.

Perennial or annual herbs with rhizomatous rootstocks, triangular or terete mostly solid stems, alternate mostly radical leaves and small perfect, monœcious or diœcious flowers in the axils of imbricated glumaceous bracts or scales. Perianth none or represented by bristles or scales. Stamens usually 2 or 3, hypogynous, with basifixed anthers. Ovary 1-celled, with an erect anatropous ovule and a 2-3-cleft style, in fruit a lenticular or more or less triangular membranaceous, crustaceous or bony achene. Embryo minute, lenticular or turgid, at the base of copious albumen.

* Flowers of the spikelets all or at least one of them perfect: spikelets all alike, few- to many-flowered, capitate or umbellate, one or two of the lower scales usually sterile.

+ Spikelets more or less flattened, the scales being in two ranks: inflorescence involucre.

1 **Cyperus** Inflorescence spicate or clustered: perianth none: style persistent.

2 **Dulichium**
pers.

+ all around

3 **Scirpus**
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4 **Eriophorum**
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5 **Hemiphragma**
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6 **Eleocharis**
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7 **Stenotaphrum**
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8 **Rhynchospora**
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- 2 **Dulichium** Inflorescence axillary: perianth of 6-9 bristles: style persistent.
+ + Spikelets many-flowered, not flattened, the scales imbricated all around.
+ + Styles not enlarged at base.
- 3 **Scirpus** Spikelets solitary or clustered, or in a compound umbel, involucre: perianth of few barbed persistent bristles or wanting.
- 4 **Eriophorum** Spikelets solitary or few, involucre: perianth of numerous long silky naked bristles: stamens 1-3.
- 5 **Hemicarpha** Low annuals: spikelets solitary or few, in a sessile apparently lateral cluster: perianth a minute hyaline bractlet between each flower and the rachis: stamen only one.
+ + Style enlarged at base.
- 6 **Eleocharis** Spikelet solitary and terminal upon a leafless terete stem: perianth of 3-9 retrorsely barbed bristles, or wanting: stamens 3: base of the style persistent.
- 7 **Stenophyllus** Low annuals, the stem leafy at base; spikelets in an involucre umbel: perianth none: stamens 1-3.
* * Spikelets polygamous, few-flowered, ovoid, the scales imbricated all around, only the terminal one fertile.
- 8 **Rhynchospora** Stems leafy: spikelets variously clustered: perianth of 9-12 retrorsely barbed bristles: achenes lenticular, beaked by the persistent base of the style.
* * * Flowers monœcious, in the same or distinct spikelets, or dioecious: pistillate flowers enclosed in an inflated sac-like persistent perigynium.
- 9 **Carex** Spikelets solitary, spicate or paniced: perianth wholly wanting, or of a single short bristle at the base of the ovary.

1 CYPERUS L. Sp. 44.

Perennial or annual herbs with mostly triangular nearly naked simple stems, alternate nearly radical leaves and perfect flowers in few- to many-flowered mostly flattened spikelets, the concave more or less carinate scales in 2 ranks. Perianth wholly wanting. Stamens 1-3. Style not thickened at base, 2-3-cleft, deciduous. Achenes lenticular or 3-angled, not beaked, smooth or nearly so.

C. inflexus Muhl. Gram. 16. **C. aristatus** Beckl. in part. Annual: stems slender or almost filiform, diffusely branched from the base, 1-6 inches high: leaves a line wide or less, about equalling the stem: those of the involucre 2-3, exceeding the inflorescence: umbel sessile, 1-3-rayed: spikelets linear-oblong, 6-10-flowered, 2-3 lines long: scales bright brown, lanceolate, rather firm, strongly several-nerved, tapering into a long recurved awn, falling from the rachis at maturity: stamens 1: style 3-cleft: rachis narrowly winged, the wings persistent: achenes 3-angled, dull brown, narrowly obovoid or oblong, obtuse, mucronulate. In wet sandy soil, California to British Columbia and the Eastern States.

C. acuminatus Torr. & Hook. Ann. Lyc. N. Y. iii, 435. Annual: stems very slender, tufted, 2-15 inches high: leaves light green, usually less than a line wide, often equalling the stem, those of the involucre much elongated: umbel 1-4-rayed, simple, rays short: spikelets flat, ovate oblong,

obtuse, 2-4 lines long, many-flowered, densely capitate: scales oblong, pale green, 3-nerved, coarsely cellular, conduplicate, with a short sharp more or less recurved tip: stamens 1: style 3-cleft: achenes sharply 3-angled, gray, oblong, narrowed at each end, almost half as long as the scale. In moist sandy soil, California to Oregon and Illinois.

C. esculentus L. Sp. 45. *C. phynatoides* Muhl. Perennial by scaly horizontal tuber-bearing rootstocks: stems usually stout, 6-30 inches high: leaves bright green, as long or longer than the stem, 2-4 lines wide, the midrib prominent; those of the involucre much longer than the inflorescence: umbel 4-10-rayed, often compound: spikelets numerous, in loose spikes, straw-color or yellowish brown, flat, spreading, 6-12 lines long, many-flowered: scales ovate-oblong, subacute, 3-nerved: rachis narrowly winged: stamens 3: style 3-cleft: achenes obovoid, obtuse, 3-angled. In moist sandy fields, Alaska to California and the Atlantic States.

C. erythrorhizos Muhl. Gram. 20. Stems tufted, stout or slender, 3 inches to 2 feet high: leaves 1-4 lines wide, rough-margined, those of the involucre 2-7, some of them often 4 times as long as the inflorescence: umbel mostly compound, several-rayed: spikelets linear-subulate, 3-10 lines long, less than a line wide, compressed, many-flowered, clustered in oblong nearly or quite sessile spikes: scales chestnut-brown, oblong-lanceolate, mucronulate, appressed, separating from the rachis at maturity: the membranous wings of the rachis separating as a pair of hyaline interior scales: stamens three: style three-cleft: achenes sharply 3-angled, oblong, pointed at both ends, pale, $\frac{1}{2}$ as long as the scale. In wet soil, Oregon to California and the Eastern States.

C. Houghtoni Torr. Ann. Lyc. N. Y. iii, 277. Perennial by tuber-like corms: stems slender, erect, 1-2 feet high: leaves shorter than the stem: a line or less wide, smooth; those of the involucre 3-5, the longer much exceeding the inflorescence: umbel simple, 1-5-rayed, the rays mostly short: their sheaths 2-toothed: spikelets loosely capitate, linear, compressed, acute: 4-8 lines long, about a line wide, 11-15-flowered, falling away from the axis when mature: chestnut brown, firm, somewhat spreading, shining, oblong, obtuse, truncate or apiculate: rachis very narrowly winged: stamens 3: style 3-cleft: achene broadly oblong, 3-angled, brown, apiculate, nearly as long as the scale. In sandy soil, along the Columbia river to the Eastern States.

2 DULICHIMUM L. C. Richard Pers. Syn. i, 65. (1805.)

Tall perennial herbs with terete hollow jointed stems, leafy to the top, the lower leaves reduced to sheaths, flat grass-like leaves and perfect flowers in axillary simple or compound spikes. Spikelets flat, linear, many-flowered. Scales 2-ranked, carinate, conduplicate, decurrent on the joint below. Perianth of 6-9 reporsely barbed bristles. Stamens 3. Style 2-cleft at the apex, persistent as a beak on the summit of the linear-oblong achene.

D. spathaceum Pers. Syn. i, 65. Stems stout. 1-3 feet high, erect: leaves numerous, flat, 1-3 inches long, 2-4 lines wide: spikelets shorter than or the uppermost exceeding the leaves: pedicels 2-12 lines long: spikelets narrowly linear, spreading. 6-12 lines long, about a line wide, 6-12-flowered: scales lanceolate, acuminate, appressed, brownish: bristles of the perianth stiff, longer than the achene: style long-exserted. In marshes Oregon to Minnesota and Nova Scotia.

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3 SCIRPUS L. Sp. 47.

Tufted annual or perennial herbs with creeping rootstocks, leafy stems, or the leaves reduced to sheaths in some species, and perfect flowers in a terminal or apparently lateral involucre cluster or compound umbel-like panicle. Spikelets usually many-flowered, with the scales closely imbricated around the rachis, the lower one or two often empty. Perianth of 3-6 bristles or none. Stamens 1-3. Style 2-3-cleft, scarcely or not at all thickened at base, deciduous or only the base persistent. Achenes lenticular or more or less 3-angled or obovoid.

§ 1 ISOLEPIS Benth. Stems low and slender. Spikelets solitary, small, with a single erect involucre bract. Perianth none.

S. riparius Spreng. Stems tufted, from fibrous roots, very slender, often setaceous, 2-10 inches high, sheathed at base, the upper sheath usually bearing a short slender leaf: involucre bract 1-10 lines long or nearly wanting: spikelets ovate to ovate-oblong, 1½-3 lines long: scales pale or often deep brown, with a pale prominent midrib, concave, obtuse or pointed: stamens usually 3: style 3-cleft: achene triangular-obovoid, with distinct angles, the sides convex, dark brown when mature. In marshy places near the coast Oregon to California and South America.

§ 2 EUSCIRPUS Benth. Bristles present, retrorsely barbed or ciliate, not elongated.

* Inflorescence terminal, without involucre.

S. nanus Spreng. Pug i, 4. Annual: stems filiform, flattened, grooved, tufted, erect or ascending, 1-2 inches high, bearing bladeless scarious sheaths near the base: spikelet solitary, ovoid-oblong, 3-8-flowered, 1-1½ lines long: scales ovate or lanceolate, pale green, the lower obtuse, the upper scutish: bristles about 6, longer than the achene: stamens 3: style 3-cleft: achene oblong 3-angled, pale pointed at each end, smooth. Muddy places, Oregon to Alaska and the Atlantic States.

S. pauciflorus Lightf. Fl. Scot. 1078. Perennial by filiform rootstocks: stems very slender little tufted, 3-10 inches high, upper sheaths truncate: spikelets solitary, oblong, 4-10-flowered, 2-3 lines long: scales brown with lighter margins and midrib, lanceolate, acuminate: bristles 2-6, hispid, as long as the achene or longer: stamens 3: style 3-cleft: achene obovoid-oblong, gray, rather abruptly beaked, its surface finely reticulated. In wet soil along the Columbia river, Oregon to Brit. Columbia, Ontario and New York.

* * Inflorescence apparently lateral, with a single involucre leaf.

— Stems terete or nearly so.

S. subterminalis Torr. Fl. U. S. i, 47. Stems slender, terete, nodulose, 1-3 feet high: leaves slender, channelled, 6 inches to 2 feet long, 1-1½ line wide. spikelet solitary, terminal, oblong-cylindric, narrowed at each end, 4-5 lines long: involucre bract 6-12 lines long: scales ovate-lanceolate, acute, membranaceous, light brown with green midrib: bristles about 6, as long as the achene or shorter: stamens 3: style 3-cleft to about the middle: achenes obovoid, 2-angled, dark brown, smooth, about a line long, obtuse, abruptly beaked by the slender base of the style. In ponds and streams, eastern Washington to Pennsylvania and New Brunswick.

S. Nevadensis Watson Bot. King, 380. Stems clustered, from run-

ning rootstocks, 6 inches to 2 feet high, somewhat flattened above, leafy: leaves nearly equalling the stem, deeply channelled or revolute, very rough on the margins, sharply acute: spikelets 1-8, in a sessile cluster, ovate-oblong, acute, 4-10 lines long: scales brown and shining, ovate, sharply carinate, acutish; bristles 1-3, not half the length of the achene: style 2-cleft: achene broadly ovate, plano-convex, acute, a line long. In alkaline soil on borders of lakes, eastern Oregon to Nevada and California.

S. lacustris L. Sp. 48. Perennial by stout rootstocks: stems stout, terete, 6-12 feet high, often nearly an inch in diameter, sheathed below, the upper sheath sometimes extended into a short leaf: involucre bract stout, shorter than the inflorescence: spikelets numerous, solitary or more or less clustered in an irregularly compound umbel, oblong-ovate, 3-6 lines long: scales broadly ovate, very obtuse to emarginate and mucronate, ciliate, often pubescent, usually pale with fine brown lines; bristles usually 6, slender, equalling or longer than the achene; stamens 3, style 2-cleft: achene broadly obovate, rounded at the summit, abruptly short beaked. In marshes, Alaska to California and the Atlantic States; also in Europe.

+ + Stems acutely triangular or triquetrous.

S. Olneyi Gray Bost. Journ. Nat. Hist. v, 238. Stem stout, 2-7 feet high, from a stout running rootstock more or less deeply triquetrous or wing-angled, sheathed at base; leafless or with a few short leaves; involucre bract stout, triangular, an inch or less longer than the inflorescence: spikelets 2-12, in a crowded sessile cluster, oblong-ovate, brown: bristles 4-6, shorter than or equalling the achene: stamens 2 or 3: style 2-cleft: achene obovate, plano-convex, mucronate, brown. In salt marshes, eastern Oregon to California and the Eastern States.

S. Americanus Pers. Syn. i, 68. *S. pungens* Vahl. Stems usually slender, from long perennial rootstocks, 1-4 feet high, acutely triangular, somewhat leafy at base: leaves 1-4, shorter than the stem, keeled; involucre bract more or less channelled, 1-4 inches long: spikelets 1-6, closely crowded in a sessile cluster, ovate to ovate-oblong: scales brown, often very dark, broadly ovate, emarginate and usually tipped with a straight awn: bristles 2-6, shorter than or equalling the achene: stamens 3: style usually 2-cleft: achene obovate, smooth, dark brown mucronate. Common in salt marshes, throughout the United States.

* * * Stems triangular, leafy at base: leaves flat: involucre foliaceous.

Spikelets large, few, in a sessile cluster or sparingly umbellate, rufous.

S. robustus Pursh Fl. 56. Stems stout, 1-3 feet high, from running often tuberiferous rootstocks: leaves flat, equalling or exceeding the stem: involucre bracts unequal, one much longer and more erect: spikelets ovate to oblong-ovate, acute, 5-10 lines long: scales ovate, 2-3 lines long, dull brown, emarginate, tipped with a long slender soon reflexed awn: bristles 1-6, fragile, shorter than the achene: stamens 3: style 3-cleft: achene compressed very flat on the face, convex, or with a low ridge on the back, obovate-orbicular, dark brown, shining, $1\frac{1}{2}$ lines long. In salt marshes, Bri. Columbia to California and the Atlantic States.

+ + Spikelets small, numerous, greenish or light brown, in a compound or decomposed umbellate panicle.

S. microcarpus Presl. Reliq. Hænk. i, 195. *S. sylvaticus* var. *digynus* Bohl. Stems usually stout, 3-5 feet high, from perennial rootstocks: leaves ample, often exceeding the stem, rough-margined, those of the involucre usually exceeding the inflorescence: panicle ample, decomposed, rather loose: spikelets ovoid, oblong, acute, $1\frac{1}{4}$ -2 lines long, 3-25 together

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S. atrovirens Muhl. Gram. 43. Stems rather slender, leafy, 2-4 feet high, from slender perennial rootstocks: leaves elongated, rough on the margins, dark green, 3-8 lines wide one or two of them usually exceeding the inflorescence: umbel simple or 1-2-compound: spikelets ovoid-oblong, acute, 6-20 in the dense capitate clusters at the ends of the rays or raylets: scales greenish-brown, oblong, acute, the midrib excurrent, bristles usually 6, about as long as the achene: stamens 3: style 3-cleft: achene obovoid-oblong, 3-angled, pale dull brown. In swamps, Oregon to Nova Scotia and Georgia.

S. lineatus Michx. Fl. i, 32. Perennial by stout rootstocks: stems rather slender, erect, 1-3 feet high, leafy: leaves light green, shorter than the stem, 2-4 lines wide, the upper ones and those of the involucre not exceeding the inflorescence, flat, rough on the margins: umbels terminal and commonly also axillary, decompound, the rays very slender, becoming pendulous: spikelets mostly solitary at the ends of slender raylets, oblong, obtuse, 3-5 lines long: scales ovate or oblong, reddish-brown with green midrib: bristles 6, weak, smooth, much longer than the achene: stamens 3: style 3-cleft: achenes oblong, pale brown, narrowed at both ends, 3-angled, short-beaked. In wet places, Oregon to Texas, Georgia and Ontario.

§ 3 Stems leafy, bearing a sessile head of spikelets subtended by a few involucre bracts. Bristles elongated, the barbs directed upward.

S. criniger Gray Proc. Am. Acad. vii, 392. Stems slender, 3 inches to 3 feet high, from slender matted rootstocks, triangular and striate, rough above: leaves flat, rough on the margins, the radical one elongated but shorter than the stem, the cauline only an inch or two long, distant, the uppermost usually very near the top: involucre bracts broad and scale-like, acuminate, 2-4 lines long: spikelets 5-9, oblong, 3-4 lines long: scales thin and soft, brownish, oblong: bristles 6: filaments slender, much exerted: style 3-cleft: achenes oblong, 3-angled, acute and shortly beaked, a line long. In marshes, southern Oregon to California.

4 ERIOPHORUM L. Sp. 52.

Low herbs with creeping perennial rootstocks, triangular or nearly terete stems, grass-like leaves and small perfect flowers in terminal solitary or umbellately clustered spikelets subtended by a one- to several-leaved involucre or naked. Scales spirally imbricated, usually all fertile. Perianth of few to many filiform smooth soft exerted bristles. Stamens 1-3. Style 3-cleft. Achenes 3-angled, oblong, ellipsoid or obovoid.

* Involucral leaves none: spikelets solitary.

E. vaginatum L. Sp. 52. Stems stiff, tufted, obtusely triangular, smooth, slender, 8-16 inches high, leafless except at base, bearing 2 inflated sheaths, the upper one usually above the middle: leaves stiff, filiform, triangular, channelled, shorter than or sometimes exceeding the stem: spikelet ovoid, erect: scales ovate-lanceolate or the lowest lanceolate, acuminate, purple-brown, thin: bristles numerous, white, straight, glossy, 4-5 times as long as the scale: anthers linear: achene obovoid, obtuse

brown, minutely apiculate. In high mountain bogs, Washington to Alaska Newfoundland and Pennsylvania.

E. Scheuchzeri Hoppe Taschenb. 1800, 104. Stems slender, smooth, nearly terete, 10-20 inches high, leafy below, often with a leafless sheath above: leaves filiform, channelled, usually much shorter than the stem: spikelet erect: scales ovate-lanceolate, long-acuminate, purple-brown, membranaceous: bristles numerous, white or slightly yellowish, weak, nearly straight, 4-5 times as long as the scale: achene narrowly oblong, brown, acute and somewhat beaked. In bogs, Oregon to Alaska and Newfoundland.

E. russeolum Fries Novet. Mant. ii, 67. Stems solitary or little tufted, triangular, smooth, 8-20 inches high, leafy at base, bearing an inflated mucronate sheath above: leaves filiform, triangular, channelled, mucronate, 1-4 inches long: spikelet erect: scales ovate-lanceolate, acuminate, thin, purplish-brown with narrow white margins: bristles numerous, bright reddish brown, an inch or more long: achene oblong, narrowed at each end, apiculate. In marshes, Oregon to Alaska and Newfoundland.

* Spikelets several, subtended by a 1-4-leaved involucre.

E. polystachyon L. Sp. 52. Stems stiff, smooth, triangular above, nearly terete below, 1-3 feet high, leafy: leaves flat, shorter than the stem, 1-4 lines wide, tapering to a triangular rigid point: involucre of 2-4 leaves, commonly equalling or exceeding the inflorescence: spikelets 3-12, ovoid or oblong, nodding, in a terminal more or less compound umbel; rays filiform: scales ovate-lanceolate, acute, or acuminate, purple-green or brown: bristles numerous, bright white, about an inch long: achenes obovoid, obtuse, light brown. In bogs, Oregon to Alaska and the Atlantic States: also in Europe and Asia.

E. gracile Koch Roth. Catal. Bot. ii, 259. Stems slender, obtusely 3-angular, rough on the angles, 1-2 feet high, leafy: leaves narrowly linear, about a line wide, triangular-channelled, rough-margined, shorter than the stem: involucre commonly of a single stiff erect leaf: spikelets 3-8, capitate or subumbellate, the longer-peduncled ones drooping: scales ovate or oblong, obtuse or subacute, greenish-brown, the midrib rather strong: bristles numerous, bright white, 8-12 lines long: achenes linear-oblong, acute, pointed. In bogs, California to Alaska and across the Continent: also in Europe and Asia.

5 HEMICARPHA Nees & Arn. Edinb. New Phil. Journ. xvii, 263.

Low or dwarf setaceous annuals with flattened stems, somewhat leafy at base, linear leaves and 1-3 small spikelets sessile in an involucre cluster. Scales spirally imbricated all around, deciduous. Flowers perfect. Perianth of a single hyaline scale between the rachis and the flower. Stamens 1-3. Style 2-cleft, deciduous, not enlarged at base. Achenes oblong, turgid or lenticular.

H. subsquarrosa Nees in Mart. Fl. Bras. ii, Pt. 1, 61. Stems tufted, numerous, 1-6 inches high, with brown sheaths at base: leaves 1 or 2, very short, filiform: principal involucre bract continuous with the stem, 6-12 lines long, the others much smaller or wanting: spikes 1-3, brownish, ovate, 1-1½ lines long: scales numerous, cuneate-obovate, shortly acuminate and slightly spreading at the tip or erect, ¼ line long, little exceeding the obtuse nutlet. In moist sandy soil, Washington to Brazil and the Atlantic States.

H. occidentalis Gray Proc. Am. Acad. vii, 391. Stems filiform, 1-2

inches high, tufted, with reddish-brown basal sheaths: leaves filiform, shorter than the stem: principal involucre bract continuous with the stem, 5-8 lines long, the others shorter: spikelets greenish, broad: ovate: scales with broadly ovate base and long acuminate spreading tips, twice as long as the nutlet: hyaline scale truncate or erosely toothed, not adherent to the nutlet. In wet grounds, base of Mount Adams Washington to California.

H. intermedia Piper Fl. Palouse Reg. 36. Stems numerous, tufted, 2-4 inches high: leaves narrow, involute, the recurved blades 6-18 lines long: spikelets ovoid, obtuse, 1-2 lines long: involucre bracts usually 3, the uppermost 6-18 lines long, the others much shorter: scales $\frac{1}{2}$ -1 line long, broadly obovate, the abruptly acuminate somewhat spreading or recurved apex as long as the body: hyaline scale triangular-ovate, not adherent to the nutlet, which is oblong-ovate or obovate, about $\frac{1}{2}$ line long, with a short beak. Margins of ponds along the Columbia and Snake rivers, Oregon and Washington.

6 **ELEOCHARIS** R. Br. Prodr. Fl. Nov. Hol. i, 224. (1810.)

Annual or perennial herbs with simple triangular, quadrangular, terete, flattened or grooved stems, the leaves reduced to sheaths, or the lowest rarely leaf-bearing, and small flowers in dense solitary terminal spikes without an involucre. Scales concave, spirally imbricated all around. Perianth of 1-12 bristles, usually retrorsely barbed, wanting in some species. Stamens 2 or 3. Style 2-cleft, the base persistent and forming a tubercle on the summit of the more or less 3-angled achene.

E. ovata R. & S. Syst. ii, 152. Glabrous annual with fibrous roots: stems tufted, slender or filiform, rather deep green, nearly terete, mostly erect, 2-16 inches high: spike ovoid or oblong, obtuse, many-flowered, 2-5 lines long, 1-1 $\frac{1}{2}$ lines in diameter: scales thin, oblong-orbicular, very obtuse, brown with green midrib and scarious margins: bristles 6-8, deciduous, usually longer than the achene: stamens 2 or 3: style 2- or 3-cleft: achene pale brown, shining lenticular, obovate-oblong, smooth, $\frac{1}{2}$ line long or more: tubercle deltoid, acute, compressed, scarcely constricted at base, about $\frac{1}{4}$ as long as the achene and narrower. In wet soil, Oregon to Brit. Columbia, New Brunswick and Florida: also Europe.

E. palustris R. & S. l. c. 151. Perennial by horizontal often densely matted rootstocks: stems stout, terete or somewhat compressed, striate, 1-5 feet high: basal sheaths brown, rarely bearing a short blade, the upper obliquely truncate: spike ovoid-cylindric, 4-12 lines long, 1 $\frac{1}{2}$ -2 lines in diameter, many-flowered, thicker than the stem: scales ovate-oblong or ovate-lanceolate, purplish brown with scarious margins and green midrib, or pale green all over: bristles usually 4, slender, longer than the achene and tubercle, sometimes wanting: stamens 2 or 3: style 2- or 3-cleft: achene lenticular, smooth, yellow, $\frac{2}{3}$ line long: tubercle conic-triangular, constricted at the base, flattened, $\frac{1}{4}$ - $\frac{1}{2}$ as long as the achene. In ponds and moist meadows, Alaska to California and across the continent: also in Europe and Asia.

Var. glaucescens Gray Man. ed. 5, 558. stems slender or nearly filiform, 8-18 inches high: spikes oblong, 2-5 lines long: achenes smaller: tubercle narrower. In wet meadows and marshes, range nearly of the type in North America.

E. acicularis R. & S. l. c. 154. Perennial by filiform stolons or rootstocks: stems tufted, filiform or setaceous, obscurely 4-angled and grooved, weak, erect or reclining, 1-8 inches long: sheaths truncate: spikes com-

pressed, narrowly ovate or linear-oblong, acute, broader than the stem, 2-10-flowered, 1-4 lines long, $\frac{1}{2}$ line wide: scales oblong, obtuse, or the upper subacute, thin, pale green, usually with a narrow brown stripe on each side of the midrib, deciduous, many of them commonly sterile: bristles 2-4, fragile, fugacious, shorter than the achene: stamens 3: style 3-cleft: achenes obovoid-oblong: tubercle conic, acute, $\frac{1}{4}$ as long as the achene. In wet soil, throughout North America: also Europe and Asia.

E. rostellata Torr. Fl. N. Y. ii, 347. Perennial by a short caudex: stems slender, the fertile erect, the sterile reclining and rooting at the apex, 1-6 feet long: upper sheaths truncate: spikes oblong, narrowed at both ends, thicker than the stem, 10-20-flowered, 4-8 lines long, about a line in diameter: scales ovate, obtuse or the upper acute, green with a somewhat darker midrib and slightly scarious margins: bristles 4-8, longer than the achene and tubercle: stamens 3: style 3-cleft: achene oblong-obovoid, obscurely 3-angled: tubercle conic-subulate, about half as long as the achene. Brit. Columbia to California and the Atlantic States.

7 STENOPHYLLUS Raf. Neog. 4. (1825.)

Annual herbs with slender erect stems, narrowly linear or filiform leaves with ciliate or pubescent sheaths and perfect flowers in umbellate, capitate or solitary spikelets subtended by a one- to several-leaved involucre. Scales spirally imbricated all around, mostly deciduous. Perianth wholly wanting. Stamens 2 or 3. Style 2- or 3-cleft, glabrous, at base much swollen and persistent on the achene as a tubercle. Achene 3-angled, turgid or lenticular.

S. capillaris Britton Bull. Torr. Bot. Club xxi, 30. *Fimbristylis capillaris* Gray. Stems filiform, densely tufted, erect, grooved, smooth, 2-10 inches high: leaves filiform, roughish, much shorter than the stem, their sheaths more or less pubescent with long hairs: involucre leaves 1-3, setaceous, shorter than or one of them exceeding the inflorescence: spikelets narrowly oblong, somewhat 4-sided, 2-4 lines long, less than a line thick, several in a simple or compound umbel, or sometimes solitary: scales oblong, obtuse or emarginate, pubescent, dark brown with green keel: stamens 2: style 3-cleft: achenes yellowish brown, narrowed at base, very obtuse or truncate at the summit $\frac{1}{4}$ line long, 3-angled, transversely wrinkled: tubercle minute, depressed. In dry or moist soil throughout North America.

8 RYNCHOSPORA Vahl. Enum. ii, 229. (1806.)

Leafy-stemmed herbs with erect 3-angled or terete stems, narrow flat or involute leaves and small flowers in variously clustered spikelets. Scales thin, 1-nerved, imbricated all around, usually mucronate by the excurrent midrib, the lower empty. Upper flowers imperfect, the lower perfect. Perianth of 1-20 barbed or scabrous bristles or none. Stamens commonly 3. Style 2-cleft, 2-toothed or entire. Achenes lenticular or swollen, capped by the persistent base of the style, or sometimes by the whole style.

R. alba Vahl Enum. ii, 236. Pale green: rootstock short: stems slender or almost filiform, glabrous, 6-20 inches high: leaves setaceous, $\frac{1}{4}$ - $\frac{3}{4}$ line wide, shorter than the stem: spikelets several or numerous, in 1-4 dense corymbose terminal and axillary clusters, narrowly oblong, acute, at both ends, 1-3 lines long: scales ovate or ovate-lanceolate, white, acute: bristles 9-15, downwardly barbed, slender, about as long as the achene and tubercle: achene obovate-oblong, smooth, pale brown, lenticu-

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9 CAREX L. Sp. 972.

Perennial herbs with triangular stems, linear 2-ranked leaves and monœcious, dioecious or androgynous flowers borne in terminal solitary or racemed spikes, each usually subtended by a leaf-like bract. Perianth none or rarely represented by a single bristle. Staminate flowers of 3 stamens with filiform filaments, usually all in the terminal spike. Pistillate flowers of a single pistil with a style and 2 or 3 stigmas, borne on a very short axis in the axil of a sac-like bractlet or second bractlet called the perigynium which completely encloses the 3-angled, lenticular or plano-convex achene.

SUBGENUS I EUCAREX Cosson Fl. Paris, 744. Staminate flowers in one or more terminal spikes, sometimes with pistillate flowers at the base or apex. Pistillate flowers in distinct and simple mostly peduncled spikes. Cross-section of the perigynium circular, obtusely angled or prominently trigonous in outline. Style mostly 3-parted and the achene triangular or triquetrous.

TRIBE I PHYSOCARPÆ Drejer Symb. Car. 10. Spikes few to many, distinct, densely flowered. Perigynium mostly straw-color at maturity, papery in texture, more or less inflated, smooth, nerved, tapering into a beak as long or longer than the body. Stigmas mostly 3.

§ 1 PAUCIFLORÆ Tuckerman Enum, Meth. 7. Spike androgynous, the pistillate flowers at the base, few. Perigynium greenish, linear-lanceolate, several times longer than the scale.

C. *pauciflora* Lightf. Fl. Scot. 545, t. 6. Glabrous: stems erect or ascending, very slender, 4 inches to 2 feet high: leaves very narrow, shorter than the stem, the lowest reduced to toothed sheaths: scales inconspicuous, lanceolate to ovate, deciduous: perigynium scarcely inflated, 3-4 lines long, about $\frac{1}{2}$ line in diameter, tapering from below the middle into a slender or almost subulate beak, strongly reflexed: stigmas 3. In bogs, Washington to Alaska, Newfoundland and Pennsylvania.

§ 2 VESICARÆ Tuckerman l. c. 13. Staminate spikes commonly 2 or more. Pistillate spikes usually long-cylindrical and dense. Perigynium smooth and shining, much inflated, at maturity straw-color or sometimes purple, beaked and conspicuously 2-toothed, usually prominently few-nerved. Stigmas 3.

C. *utriculata* Boott Hook. Fl. ii, 221. Glabrous: stems stout, erect, 4 feet high: leaves elongated, the upper mostly exceeding the stem, 2-6 lines wide, the midrib prominent: bracts leaf-like: staminate spikes 2-4, near, peduncled, the lower sometimes pistillate at the top: pistillate spikes 2-4, densely many-flowered, or sometimes looser near the base, 2-8 lines long, the lower short-peduncled, the upper sessile or nearly so, sometimes staminate at the summit: scales lanceolate, the lower awned and slightly longer than the perigynium, the upper acute: perigynium ovoid, light green, 2-3 lines long, narrowed above to a sharp 2-toothed

beak. In marshes, California to Alaska and across the continent.

C. monile Tuckerman Enum. Meth. 20. Stems slender, erect or reclining, 1-3 feet high; leaves elongated, rather light green, 1-4 lines wide, sometimes exceeding the stem; bracts similar, often longer than the inflorescence; staminate spikes 1-4, slender-peduncled; pistillate spikes 1-3, cylindrical, 1-3 inches long, about 4 lines in diameter, rather loose at maturity, the upper sessile, the lower one when 3, slender-peduncled and usually remote; perigynium yellowish-green, ovoid, inflated, about 2½ lines long, tapering into a sharp 2-toothed beak, longer than the lanceolate acuminate scale. In marshes and wet meadows, California to Alaska and across the continent.

C. exstecata Bailey Mem. Torr. Bot. Club, 1, 6. Stems stout, erect, 1-3 feet high; leaves pale green, 4-6 lines wide, the upper ones surpassing the stem; staminate spikes 1 or 2, slender; pistillate spikes 1-3, cylindrical, 1-3 inches long, nearly sessile or the lowest one slender-peduncled; scales very narrow, mucose; perigynia lance-ovate, scarcely inflated, strongly nerved, 3-4 times longer than the scale. In swales, Oregon and Washington.

Var. globosa Bailey l. c. More slender, with narrower leaves; spikes small, an inch or less long, more or less scattered, closely sessile, rusty in color; scales hyaline and very small; perigynia narrower, conspicuously spreading. In ponds on the high mountains, Oregon to British Columbia.

C. retrorsa Schwein. Ann. Lyc. N. Y. 1, 71. Glabrous; stems stout, erect, 1-3 feet high; leaves elongated thin, rough-margined, 2-4 lines wide, the upper usually exceeding the stem; the bracts similar; staminate spikes 1-3, short-peduncled; pistillate spikes 3-6, all close together at the top and sessile or nearly so, or the lowest distant and peduncled, densely-flowered, 1-2 inches long, 6 lines in diameter; perigynia ovoid, membranous, yellowish-green, about three lines long, tapering into a subulate 2-toothed beak, ½ longer than the smooth lanceolate acute scale, reflexed at maturity. In bogs and wet meadows, Oregon and the Atlantic States.

C. comosa Boott Trans. Linn. Soc. xx, 117. Stems stout, 2-3 feet high; leaves ample, rough on the margins, 5-6 lines wide; staminate spikes erect, short-peduncled, sometimes pistillate at the top; pistillate spikes 5-6, all on slender peduncles, or the uppermost nearly sessile all nodding or spreading, about 2 inches long, 5-7 lines in diameter; scales narrow, very rough, oblong or lanceolate, short acuminate, about 2 lines long; perigynia with oblong little inflated base and long slender 2-toothed beak, twice as long as the scale; the long slender teeth spreading. In bogs, Washington to California and the Atlantic States.

TRIBE II TRACHYCHLÆNÆ Drejer Symb. Car. 9. Staminate spikes one or more. Pistillate spikes compactly flowered, mostly large, erect or nearly so. Stamens 3. Perigynia mostly thick and hard in texture, commonly scabrous or hirsute, straight-beaked.

§ 1 ANOMALÆ Carey Gray's Man. 557. Terminal spikes all staminate; pistillate spikes long and cylindrical, mostly densely flowered. Perigynia broad and short, short-beaked, the apex very slightly toothed or entire, mostly granulate.

C. amplifolia Boott, Hook. Fl. ii, 228, t. 226. Stems stout, 2-3 feet high, very sharply angled, rough above; leaves many, 5-8 lines wide, rough on the margins, usually exceeding the stem; bracts leaf-like, without sheaths; pistillate spikes 4-6, erect, the upper one sessile, the lower

short-peduncled, conspicuously flowering, about as long as the stem, in wet places in woods.

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short-peduncled, 1-4 inches long slenderly cylindrical: perigynia elliptic conspicuously few-nerved, abruptly narrowed into a whitish beak, spreading, about as long as the whitish purple-margined awn-pointed scale. In wet places in wooded districts, California to Oregon and Idaho.

§ 2 *HIRTÆ* Tuckerman Enum. Meth. 14. Terminal spike all staminate: pistillate spikes densely many-flowered. Perigynia more or less hairy, the beak more deeply toothed.

C. Oregonensis Olney Proc. Am. Acad. viii, 407. Stems smooth or nearly so, very leafy, about a foot high: pistillate spikes about 3, an inch long, often staminate at the top, erect, approximate, shortly peduncled: perigynia ovate, tapering at both ends, prominently many-nerved, thickly covered with short stiff hairs, gradually produced into a white and smooth distinctly 2-toothed beak, longer than the ovate acute membranous scale. In the higher parts of the Cascade Mountains.

C. lanuginosa Michx. Fl. ii, 175. Stems rather slender, acutely angled and rough above, 1-2 feet high: leaves and lower bract elongated, flat, not involute, 1-2 lines wide, sometimes longer than the stem: staminate spikes 1-3, long-peduncled sometimes pistillate at base: pistillate spikes 1-3, usually distant, sessile or the lowest peduncled, 9-18 lines long; scales ovate, membranous, often purplish, acuminate or short-awned: perigynia green, densely pubescent, tapering into a short 2-toothed beak, as long or longer than the scale. In moist meadows, California to Brit. Columbia and across the continent.

§ 3 *PALUDOSÆ* Fries Corp. 190. Staminate spikes 2 or more, long-peduncled: pistillate spikes 2 to several, usually all peduncled, long and heavy, loosely flowered. Perigynia large, thick in texture, strongly nerved, mostly smooth, usually produced into a long beak which terminates in conspicuous subulate erect or spreading teeth.

C. aristata R. Br. Franklin Journ. 721. Stems stout, erect, smooth or roughish above, acutely angled, 2-5 feet high: leaves elongated, 3-5 lines wide, more or less scabrous often pubescent beneath and on the sheaths: bracts similar, the lower often exceeding the stem: staminate spikes 3-5, remote, cylindrical, sessile or the lowest short-peduncled, loosely-flowered: at the base, dense above, 1-4 inches long, sometimes 8 lines in diameter scales oblong-lanceolate, rough-awned, thin-margined, perigynia ascending, conic, glabrous, 4-6 lines long, gradually tapering into the conspicuously 2-toothed beak nearly twice as long as the scale. In bogs, Oregon, the Northwest Territory, Michigan and New York.

C. riparia Curtis Fl. Lond. iv t. 60. Pale green and glabrous: stems stout or rather slender, smooth or somewhat rough above, erect, 2-3 feet high: leaves elongated, somewhat glaucous, 3-6 lines wide, about equaling the stem: staminate spikes 1-5; pistillate spikes 2-5, cylindric, 2-4 inches long, about 4 lines in diameter the upper erect, sessile or nearly so, the lower more or less peduncled: scales lanceolate or oblanceolate long-aristate or acute: perigynia narrowly ovoid, firm, scarcely inflated, tapering gradually into a short 2-toothed beak, as long or longer than the scales. In swamps, Idaho to Manitoba and Florida.

TRIBE III MICROHYNCHÆ Drejer Symb. Car 9. Paludose and alpine species of various habit, mostly with colored spikes, often growing in dense tufts. Perigynia small nearly beakless, not prominently toothed at the apex, rather thin in texture.

§ 1 *ATRATÆ* Kuntz Enum. Pl. ii, 431. Mostly alpine or boreal species. Terminal spikes club-shaped and androgynous with the staminate flowers below: pistillate spikes mostly short and dark colored.

C. alpina Swartz Lilj. Sv. Fl. ed. 2, 26. Stems slender, erect, rough above, leafy only below the middle, 6 inches to 2 feet high, leaves roughish, shorter than or equaling the stem: spikes 2-4, clustered at the summit, the terminal 1 or 2 staminate below, oblong or globose, 2-5 lines long, sessile or the lower peduncled: perigynia oval, orbicular or ovoid, light green, about a line long, tipped with a very short minutely 2-toothed beak, equaling or shorter than the ovate black or purple-brown, obtuse or acutish scale: stigmas 3. In rocky places, Oregon to Colorado, James Bay and Lake Superior; also in Europe.

C. Mertensii Prescott Bong, Veg. Sit. 168. Stems erect, rather slender, 2-3 feet high, rough on the very sharp angles, leafy: leaves broad and flat, shorter than the stem: bracts leaf-like the lower exceeding the stem: spikes 5-8, an inch or two long, very densely flowered, all more or less staminate at base, the upper one conspicuously so, all drooping, on filiform scabrous peduncles: perigynia very flat, broadly ovate, winged, very thin in texture, green or whitish, much longer and wider than the purple white-ribbed scale: Along streams, mostly high mountain streams, Oregon, to Alaska and Montana.

C. Umellii Hook. Bot. Beech. 118. t. 27. Stems slender, erect, 1-3 feet high, leaves erect, 1-2 lines wide: spikes 2-4, short and thick, peduncled, awn of the scales hispid: perigynia ferruginous, smooth, Oregon to Alaska and Siberia.

C. fusca All. Fl. Ped. 11, 269. Slender, stiff, erect, sharp-angled rough above 2-3 feet high: leaves rough, erect 1-2 lines wide, shorter than or sometimes exceeding the stem: spikes 2-4, oblong or cylindric, erect, all sessile, and close together or the lowest sometimes distant and very short, peduncled, 4-8 lines long, about 4 lines in diameter when mature, the terminal one staminate at base or sometimes throughout: scales ovate awn-tipped black or dark brown with green midvein, perigynia elliptic or or somewhat obovate flat, ascending, a line long, very light green, beakless the apex minutely 2-toothed, shorter than the scales, stigmas 3. In bogs, California to Alaska and the Eastern states, also in Europe.

§ 2 *RIGIDÆ* Fries Summa. 72. Mostly stiff and rigid with short and erect very closely flowered spikes, the terminal one entirely staminate and purple or black. Bracts with auriculate base.

C. heteroneura W. Boott Bot. Cal. ii, 239. Stems slender erect 1-2 feet high, sharply angled: leaves narrow, flat, shorter than the stem, lower bract leaf-like, nearly as long as the stem, sheathless: pistillate spikes about a half inch long, 3 lines thick, sessile or the lower ones very short peduncled, more or less contiguous, whitish or yellowish: perigynia oval, smooth, straw color, thin in texture, narrowed abruptly into a very short slightly emarginate beak, longer and broader than the obtuse or mucicose purple white-ribbed scale. In the mountains California to Idaho.

C. Reynoldsii Dewey Sill. Journ. xxxii, 39. Stems 6-18 inches high, sharply angled: leaves glaucous, 3-4 lines broad, flat, with revolute margins rather abruptly tapering to a triangular apex, shorter than the stem: spikes 3-6, oblong or obovoid, the staminate 4-9 lines long, sessile; pistillate 6-8 lines long, 3-4 lines thick, sessile or short peduncled, contiguous

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C. stylosa C. A. Meyer Act. Acad. St. Petersburg, i, 222, t. 12. Stems slender, erect, 12-18 inches high, rough and leafless above; leaves 1-2 lines wide, shorter than the stem: Staminate spikes solitary, nearly sessile, often partly pistillate, an inch or less long: pistillate spikes 2-3, 6 lines long or less, the lowest longest, slender-peduncled, the others sessile or nearly so: perigynia turgid-ovate, fuscous, minutely punctate, beakless, the entire orifice closed with the stiff and persistent style from which the stigmas are caducous, longer than the very obtuse black white-ribbed scale. In wet meadows, northern Washington to Alaska and Labrador.

C. spreta Bailey Mem. Torr. Bot. Club, 1, 6. Stems stout, 12 to 18 inches high: leaves 2-3 lines wide, usually equalling or exceeding the stem: spikes sessile 4-6 lines long, and nearly as thick, the upper 2-3 contiguous to the staminate spike: perigynia broadly elliptical, or broader than long, beakless, thin, green, longer, and much broader than the black and mucicose faintly white-nerved scale Columbia river bottoms.

C. Tolmiei Boott Hook. Fl. 11, 224. Stem rigid, 12-18 inches high triquetrous, smooth or nearly so: leaves rough on the margins, mostly shorter than the stem: lower bracts leaf-like and about equalling the stem, sheathless: spikes 4-7, the uppermost an inch or less long, staminate and mostly contiguous, oval or oblong 8-12 lines long, dark-colored, often staminate at the apex, the 2 or 3 lowest slender-peduncled 1-2 inches long: perigynia compressed-trigonous, oval or oval-oblong, pale and more or less discolored with purple dots, produced into a very short and entire cylindrical beak, either longer or shorter than the obtuse or mucicous purple white-ribbed scale. Oregon to Behring Straits.

Var. nigella Bailey Men. Torr. Bot. Club i, 47. Perigynia minutely bidentate: scale narrower and more acute.

Var. subsessilis Bailey l. c. Spikes short and thick, very densely flowered the staminate sessile; the pistillate aggregated near the top, sessile or the lowest very shortly peduncled: perigynia broader and more abruptly contracted. Eastern Oregon to Colorado.

Var. angusta Bailey l. c. Taller, leaves very long and narrow, the basal sheaths becoming fibrillose: spikes sessile or lowest peduncled, cylindrical: bracts narrow or filiform. Kerbyville Oregon.

C. Kelloggii W. Boott. Bot. Cal. 11, 240. Stems very slender 12-16 inches high, sharply angled and scabrous above: leaves 1-2 lines wide, the cauline shorter, the sterile rather longer than the stem: bracts without sheaths, the lowest slightly exceeding the stem: spikes 4-5, narrowly cylindrical or clavate, short-peduncled and loosely flowered at base, the uppermost staminate, rarely with some pistillate flowers at top or base, 9 lines long; pistillate spikes 3-12 lines long, about a line thick: scales purple with pale midrib, obtuse perigynia pale, ovate, tapering to a short beak, the orifice entire, purple, smooth, longer than the scale. In the mountains, California to Brit. Columbia.

C. decidua Boott. Linn Trans. xx, 119. Stems 12-18 inches high: leaves 1-3 lines wide, shorter than the stem: bracts without sheaths, the lower exceeding the stem: spikes 4-6, dark purple, oblong or cylindrical, the uppermost staminate, at least at base, or at both ends, 12-14 lines long, 2-3 lines thick, the others pistillate and solitary or in clusters of 2-3, 6-18 lines long, 2-4 lines thick: scales dark purple with pale centre, oblong-oval

to lanceolate and mucronulate: perigynia ferruginous, oval, rostellate with an entire beak, stipitate, papillose, deciduous, longer or shorter than the scale. Oregon to California and Patagonia.

C. nudata W. Boott Bot. Cal. ii, 241. Stems slender, 12-16 inches high, sharply angled, scabrous, leaves 1-2 lines wide setaceous pointed, shorter than the stem: bracts without sheaths, the lowest rarely equalling the stem, the others shorter than the spike: spikes 4 or 5, cylindrical, the uppermost staminate, at least above, 6-12 lines long, 1-1½ lines thick, single or rarely with a smaller one at its base, the others pistillate, 6-18 lines long, 1-2 lines thick, the highest close to the staminate and sessile, the others contiguous on short peduncles or rarely the lowest radical on a peduncle a foot long: scales dark purple, oblong, obtuse, or the lower lanceolate and acute: perigynia purple above, almost lanceolate, attenuate to an entire cylindrical beak, very deciduous. Along streams in the coast mountains, Oregon to California.

Var. angustifolia Bailey Mem. Torr. Bot. Club 16. More slender and lax: leaves narrower: spikes 6-9 lines long, sessile or nearly so: perigynia shorter and relatively broader: much more abruptly contracted above. Along streams in the Coast Mountains, Oregon to the Mackenzie river.

Var. anomala Bailey l. c. Very slender, 18-30 inches high, the stem and leaves very rough: leaves very numerous, long and narrow: spikes 3-5, the lowest one or two on long and very slender peduncles, very narrow and thinly flowered at base, 1-2 inches long, greenish or brownish, the terminal one often pistillate at the top or throughout: perigynia firmer in texture, long and often very slender, green or greenish-yellow, longer than the narrow brown and obtuse scale. Cascade Mountains of Oregon.

C. Hallii Bailey Proc. Am. Acad. xxii, 82. Stems 1-2 feet high, sharp-angled and rough: strict: leaves narrow, rough on the margins, shorter than the stem; bracts all serrate on the margins, without sheaths the lowest more or less leaf-like and equalling the stem, the upper setaceous: spikes sessile, about 5, the terminal staminate and usually more or less peduncled, the others closely sessile and short: scales of the staminate spike very broad and obtuse, often emarginate purplish-black: perigynia flat, almost white, elliptic with contracted ends, smooth, the beak very short and entire, either much exceeding or about the length of the broad obtuse black scale. Oregon.

C. invisula Bailey l. c. Stems 5-24 inches high, sharply angled, erect, smooth: leaves nearly as long as the stem, 12 lines wide, roughish on the margins, short-pointed: spikes 4 or 5, all sessile or the two lowest on short peduncles and erect, oblong and somewhat narrowed at base, about an inch long, or short and nearly globular, the upper 1 or 2 staminate and short, the others all approximate or contiguous and pistillate: bracts short and sheathless: perigynia elliptic-ovate green and olive-colored with black-purple blotches, flat, very short beaked, the orifice entire or nearly so, broader and commonly longer than the purple-black, very conspicuously white-ribbed apiculate scale. In the mountains, California to Brit. Columbia.

C. laciniosa Boott. Ill. 175 t. 594. Stems stout, 2-3 feet high, very sharply angled: leaves stiff and carinate, pale, 2-4 lines wide: bracts without sheaths, the lowest sometimes 2½ feet long: spikes 2-6, yellowish, ferruginous, cylindrical, the staminate 1 or 2, commonly peduncled, the uppermost 2 inches long, 2-3 lines thick, sometimes with a few pistillate above the middle or at the base: the rest pistillate, 1-3 inches or more long, 2-4 lines thick, remote, densely flowered, the upper sessile, the lower

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C. nebraskensis. Dewey Sill. Journ. xviii, 102. Stems rather stout, erect, sharply angled 1-2 feet high: leaves pale green, 2-3 lines wide, rough-margined, not exceeding the stem: lower bract foliaceous, sometimes equalling the stem, the upper much shorter and narrower: staminate spikes commonly 2, peduncled: pistillate spikes 2-4, dense, oblong-cylindric, erect, 9-15 lines long, about three lines thick, sessile or the lower on short peduncles: perigynia elliptic or somewhat obovate, short-beaked, the beak 2-toothed, longer than the ovate or lanceolate acute brown scale: stigmas 2. In wet places eastern Oregon and Washington to Nebraska and New Mexico.

C. aquatilis Wahl. Kongl. Vet. Acad. Handl. (11) xxiv, 165. Stems rather stout, erect, sharp-angled above, smooth or nearly so, 2-4 feet high: leaves elongated, sometimes equalling the stem, 2-3 lines wide: bracts similar to the leaves, the lower exceeding the stem: staminate spikes 1-3, peduncled: pistillate spikes narrowly linear-cylindric, often staminate at the summit, erect or slightly spreading 1-2 inches long, 2-3 lines thick, sessile and dense or the lower narrowed and loosely flowered at the base, and short peduncled: perigynia elliptic, green, minutely beaked, the orifice entire, longer than or equalling the oblong scale: stigmas 2. In swamps and along streams. California to Brit. Columbia and the Atlantic States: also in Europe.

C. stricta Lam. Encycl. iii, 387. Stems slender, stiff, erect, usually in dense tufts, sharply angled, rough above, $1\frac{1}{2}$ -4 feet high: leaves long, rarely exceeding the stem, very rough on the margins 1-2 lines wide: lower bracts similar, sometimes equalling the stem: staminate spikes solitary or sometimes 2, peduncled: pistillate spikes 2-5, linear-cylindric, often staminate at the top, very densely flowered, or loose at base $\frac{1}{2}$ -2 inches long, about 2 lines thick, all sessile or the lower peduncled: perigynia ovate elliptic, ascending, acute, a line long or less, minutely beaked the orifice entire or nearly so, longer than the brown purple green-margined oblong or lanceolate scale: stigmas 2. In swamps, California to Washington and the Atlantic States.

C. interrupta Boeckl. Linnæa xl, 432. Stems slender, erect, 12-16 inches high, sharply angled above: leaves elongated, usually exceeding the stem about 2 lines wide: bracts all shorter than the inflorescence: staminate spike usually solitary, 8-10 lines long, pistillate spikes 3-5, 6-18 lines long, about 2 lines thick, often staminate at the top, densely flowered above, the lower ones loose and often interrupted at base: sessile or the lowest one short-peduncled: scales brown with pale midrib and margins, nearly as long as the perigynium, broadly lanceolate appressed: perigynia small, green, elliptical, shortly, beaked. Along mountain streams, Western Oregon.

C. lenticularis Michx. Fl. ii, 172. Stems very slender, erect 1-2 feet high: leaves rarely over a line wide, shorter or rarely longer than the stem, slightly rough on the margins: lower bracts similar to the leaves, usually much longer than the spikes: staminate spikes solitary or rarely 2, sessile or short peduncled, often pistillate above: pistillate spikes 2-5, clustered at the summit or the lower distant, sessile or the lower short peduncled: 4-12 lines long, about 2 lines thick: perigynia ovate or elliptic, acute, tipped with a minute entire beak longer than the appressed

green scales. On shores, California to Washington and the eastern states.

C. acutina Bailey Mem. Torr. Bot. Club 1, 52. Stems erect, 16-20 inches high, smooth or rough above, leaves flat and thin, about as long as the stem: the lower 1 or 2 bracts flat and leaf-like, about equalling the stem, the margins mostly serrate: spikes 4 or 5, the upper 1 or 2 staminate, all approximate and sessile or the lower short-peduncled, 1-2 inches long: perigynia thin and soft, yellowish somewhat inflated, the small beak entire, shorter or longer and broader than the obtuse or mucicose scale. Along rivers, eastern Oregon.

Var. tenuior Bailey l. c. 53. Tall and more slender: leaves narrower; spikes an inch or less long and more scattered: perigynia smaller. Margins of mountain lakes, Oregon and Washington.

C. bovinia. Densely matted and forming extensive meadows of many acres: stems slender 12-18 inches high, erect: leaves strongly carinate, shorter than or equalling the stem: spikes all peduncled or the upper one sessile, lower more or less cernuous 12-18 lines long, nearly 3 lines thick: perigynia elliptical, somewhat inflated, broader and shorter than the lanceolate acuminate scale. On lands that are overflowed by the Columbia river in June.

§ 4 **CRYPTOCARPÆ** Tuckerman Enum. Meth. 11. Large species with cernuous or drooping large spikes which bear long and conspicuous mostly dark scales: stigmas 2.

C. cryptocarpa C. A. Meyer Mem. Acad. St. Petersb. i. 226, t. 14. Stems stout, erect, sharply angled, rough above, 1½-3 feet high: leaves smooth, pale 2-3 lines wide, the basal shorter than or equalling the stem, the upper ones and the bracts shorter, all withering with the first frosts: staminate spikes 2-4, peduncled, 1-2 inches long: pistillate spikes 2-5, all on long filiform peduncles and drooping, densely-flowered, often staminate at the top, 1-3 inches long, 3-4 lines in diameter, scales purple-brown, ascending, lanceolate, acuminate: perigynia elliptical, light colored, 1½ lines long; tipped with a very short entire beak, much shorter than the scale. In salt marshes California to Alaska and Greenland.

C. Sitchensis Prescott Bong. Veg. Sitch. 166. Stems stout, 1-4 feet high, sharply angled, rough, many-leaved at base. 3-4 lines wide, very dark green, persistent through the winter, very rigid, the radical longer than the stem: spikes dark purple, the staminate 1-4, sessile, erect, 1-3 inches long, 2-3 lines thick: pistillate spikes 3-5, sessile or more or less peduncled, 1-4 inches long, 3-5 lines thick, spreading or nodding, loosely flowered at base, dense above: scales purple, the staminate oblong, obtuse, the pistillate ovate or lanceolate, acuminate or awned: perigynia purple or orbicular-obovate, a bluntly short-beaked, stipitate, shorter than the scale. In marshes, California to Alaska.

C. Barbara Dewey Bot. Mex. Bound. 231. Stems slender 2 feet or more high, glaucous leaves surpassing the stem: pistillate spikes 2-4, linear, 1-3 inches long, the upper 1 or 2 sessile or short peduncled, the lower very long on a peduncle 3-4 inches long: scales dark, obtuse or mucicose: perigynia small appressed, pale, more or less attenuate below, abruptly contracted into a short and entire beak, nearly nerveless, shorter or longer than the white backed and brown edged obtuse or mucicose scale. Banks of streams, California and Oregon.

C. Howellii Bailey Mem. Bot. Club 145. Stems stout 3-6 feet high, sharply angled, rough above: leaves broad and lax, very long, the sheaths covering the base of the stem with a long and papery brown envelop: stam-

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§ 5 FERRUGINEÆ Tuckerman Enum. Meth. 12. Plants smaller: spikes small, an inch or less long, the upper ones often androgynous: perigynium tapering into a conspicuous point, often rough on the angles, dark-colored: bracts conspicuously sheathing: stigmas usually 3.

C. frigida All. Fl. Ped. ii, 270. Stems 8-20 inches high, leafy at base: leaves shorter than the stem: spikes 4-8, rusty-black, oblong, the terminal one staminate, the others pistillate, the upper contiguous and sessile, the lower remote and exserted on a long peduncle: bracts shorter than the stem: perigynia triangular, lanceolate, tapering to a beak, bifid at the orifice, hispid on the margins longer than the ovate acuminate mucronate scale. In wet prairies on the high mountains, Washington to California and Utah.

C. luxurifolia W. Boott. Bot. Cal. ii, 250. Stems 2-3 feet high, obtusely angled, smooth 1 or 2 leaved at or below the middle, many-leaved at base: leaves 4-10 inches long, 2-4 lines wide, acuminate to a sharp rough irregular point, much shorter than the stem bracts tapering to a short sharp point, shorter than the peduncles: spikes 8-8, the upper 1-3 staminate, clavate or obovoid, 3-6 lines long, 1-3 lines thick, often crowded so closely as to appear as a single one, the others pistillate, clavate, 6-14 lines long, 2 lines thick, the upper often sessile at the base of the staminate, the others all remote on exserted scabrous peduncles 2-6 inches long: scales purple or pale in the middle, oblong to lanceolate, ciliate obtuse or acute or roughly cuspidate: perigynia tawny or purple, oval to lanceolate, acuminate to a long cylindrical bidentate beak, stipitate, smooth, longer and broader than the scale. In the high mountains, California to southern Oregon.

§ 6 PENDULINÆ Fries Corp. 190. Bracts sheathless: perigynium whitish, more or less granulated, nearly pointless.

C. limosa L. Sp. 977. Stems slender, rough above, erect, 10 inches to 2 feet high: leaves a line wide, or less, shorter than the stem: bracts linear-filiform the lower $\frac{1}{2}$ to 2 inches long: staminate spike solitary on a long peduncle: pistillate spikes 1 or 2 on filiform peduncles, drooping, oblong 5-10 lines long about 3 lines thick: perigynia pale, oval, narrowed at both ends $1\frac{1}{2}$ lines long, tipped with a minute entire beak, about as long as the oval green or purplish-brown acute or cuspidate scale. In bogs, Idaho to New Jersey and the Atlantic regions: also in Europe.

TRIBE IV HYMENOCHLÆNE Drejer Symb. Car. 10. Staminate spikes several or many, mostly loosely flowered and on filiform nodding peduncles. Perigynia mostly light green or whitish, thin-membranaceous, mostly somewhat inflated, commonly smooth and shining, tapering gradually into a minutely 2-toothed beak.

C. capillaris L. Sp. 977. Stems slender or filiform, smooth, or roughish above, erect, 2-14 inches high: leaves $\frac{1}{2}$ -1 line wide, much shorter than the stem, flat or somewhat involute in drying, roughish: bracts all with sheathing base: spikes all on filiform peduncles, the terminal one staminate;



pistillate spikes 1-3, narrowly oblong, 2-6 lines long, 1 line thick, nodding, 10-12-flowered: perigynia oblong, 3-angled light green, the slender beak about $\frac{1}{2}$ as long as the body, longer than the oval, scarious margined scale. Idaho to Alaska, Greenland and the Atlantic States; also Europe and Asia.

C. cinnamomea Olney Proc. Am. Acad. vii. 396. Stems slender, 1-2 feet high, erect: leaves narrow-margined, shorter than the stem: bracts sheathing, longer or shorter than the stem: spikes 3-5, erect, 12-18 inches long, cinnamon colored, the terminal one staminate, fusiform and long peduncled, the others pistillate, cylindrical, densely flowered, the upper approximate, the lower on long exserted peduncles, attenuate and loosely flowered at base, the lowest remote: scales cinnamon colored with green centre, membranous, ovate, obtuse, ciliate at the apex: perigynia elliptical, 8 angled, green, rostellate with bidentate orifice ciliate within, glabrous, longer and broader than the scale. In marshes, southern Oregon and California.

TRIBE V SPIROSTACHYÆ Drejer Symb. Car. 10. Staminate spikes usually solitary, pistillate spikes 2-5, short yellowish or fuscous, compactly flowered. Perigynia smooth or minutely granulate, rarely somewhat serrate on the margins, prominently nerved, squarrose, mostly beaked, the orifice entire. Stigmas 3.

C. viridula Mich. Fl. ii. 170. Glabrous and bright green: Stems slender, erect, 4-15 inches high: leaves a line or less wide, often longer than the stem: bracts similar, strictly erect and much exceeding the spikes, sessile, sometimes pistillate at the top: pistillate spikes 2-5, all approximate and sessile or the lowest distant and short-peduncled, oblong, 2-6 lines long, 2 lines or less thick: perigynia ovoid-oblong, a line or less long, narrowed at base, tapering into a 2-toothed beak about half as long as the body, longer than the ovate scale. In wet places, Washington to Alaska, New Foundland and Pennsylvania.

TRIBE VI DACTYLOSTACHYÆ Drejer Symb. Car. 10. Bracts sheathing, the sheaths often conspicuous and colored. Staminate spike mostly one: pistillate spikes short, commonly rather loosely flowered and slender, their scales mostly whitish, often small.

§ 1 LAXIFLORÆ Kunth Enum. Pl. ii, 452. Slender, more or less broad-leaved species with mostly leafy bracts, green sheaths and loosely flowered spikes. Perigynia mostly conspicuously 3-angled, with a more or less curved beak.

C. Hendersoni Bailey Proc. Am. Acad. xxii. 115. Slender and rather weak, 1-2½ feet high: leaves thick and flaccid, 4-8 lines wide, shorter than the stem: bracts with sheaths 1-3 inches long: spikes 4-5, pale, the pistillate approximate, on short peduncles, loosely flowered: perigynia 2-3 lines long, gradually contracted at each end, longer than the firm hyaline-margined ovate obtuse often mucronate scale. In forests and thickets, Washington to California.

§ 2 PANAICEÆ Tuckerman Enum. Meth. 15. Mostly stouter narrow-leaved species. Perigynia often strongly nerved, not conspicuously trigonous, often turgid.

C. livida Willd. Sp. Pl. iv, 285. Pale green and very glaucous: Stems slender, strictly erect, smooth, 12-18 inches high: leaves 1-2 lines wide, shorter than or equalling the stem: bracts narrow, usually short: staminate spike solitary, short-peduncled: pistillate spikes 1-3, 5-12 lines

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§ BICOLORES Tuckerman l. c. 12. Small species with the terminal spike androgynous or all staminate: perigynia more or less round or pyriform, beakless, commonly glaucous.

C. aurea Nutt. Gen. ii, 205. Light green: stems very slender, erect or reclining, 2-15 inches long: leaves flat, 1-1½ lines wide, the basal equaling or exceeding the stem: bracts similar and exceeding the spikes: terminal spike short-peduncled; pistillate spikes 2-4 oblong or linear-oblong, erect and clustered near the top, or the lower one distant, on filiform peduncles, loosely or densely few-flowered, 2-10 lines long: perigynia obovoid or subglobose, yellow or brown and a line in diameter when mature, beakless, longer than or equalling the membranous acute cuspidate or short-awned scale. In wet meadows Oregon to Brit. Columbia and the Eastern States.

Var. celsa Bailey Mem. Torr. Bot. Club 1, 75. Taller and strict, 15-20 inches high: spikes large and compactly flowered, longer-peduncled. Oregon to California.

§ 4 DIGITATÆ Fries Corp. 187. Low species with ordinary leaves: sheaths membranous or hyaline and colored either not prolonged into a bract or the bract very short and not foliaceous: perigynia more or less 3-angled, often hairy, the beak straight or nearly so.

C. Richardsoni R. Br. Frankl. Journ. 751 Stems slender, rough, erect, 4-12 inches high: leaves flat, about a line wide, the basal shorter than or equalling the stem: staminate spike short-peduncled; pistillate spikes 1 or 2, erect, short-peduncled, 4-9 lines long, compactly several-flowered, close together: perigynia obovoid, pubescent, about a line long, minutely beaked, shorter than the ovate purple conspicuously white-margined scale: stigmas 3. In dry soil California to Brit. Columbia and the Eastern States.

TRIBE VII SPHÆRIODIPHORÆ Drejer Car. 9. Low species of dry ground with the leaves all radical. Staminate spikes solitary: pistillate spikes short, usually globular or short-oblong, more or less sessile and approximate or the longer ones radical. Perigynia usually short and rounded, the beak straight and usually bifid, firm or hard in texture, not inflated, hairy or scabrous.

C. filifolia Nutt. Gen. ii, 204. Densely tufted, pale green and glabrous: stems very slender, smooth, erect; 3-14 inches high: leaves filiform, rather stiff, spike solitary, erect, bractless, staminate above, pistillate below, 3-15 lines long, the pistillate part about 2 lines in diameter perigynia obovoid-oval, triangular, rough or somewhat pubescent at the summit a line long abruptly tipped by a short cylindrical hyaline entire beak, narrower than and about as long as the broadly oval scarious-margined obtuse or cuspidate scale. In dry soil California to British Columbia and Nebraska.

C. vespertina. C. Pennsylvanica of authors as to the Pacific coast plant. Stoloniferous: stems very slender, erect, 8-20 inches high: leaves

1-1½ lines wide, shorter than the stem; lower bract leaf-like, 6-12 lines long; staminate spikes usually short-peduncled, about an inch long; pistillate spikes 3, short-oblong, few-flowered; perigynia white or light colored, obovate, tipped with a rather stout 2-toothed beak, hairy, shorter than the brown scarious-margined acute or mucronate scale. In pine forests, eastern Washington and Oregon.

C. deflexa Hornem. Plantel. ed. 3, i, 938. Very low and much tufted: stems 1-6 inches high, setaceous, more or less curved or spreading; leaves narrow, nearly equalling or longer than the stems: staminate spike minute and nearly always invisible in the head; pistillate spikes 2 or 3, 2-5 flowered, green or green and brown, all aggregated into a small head, the lowest one always more or less short-peduncled and subtended by a leafy bract 4-6 lines long; perigynium very small, much contracted below, tipped with a very small flat beak. Alpine prairies eastern Oregon to Alaska, Greenland and Vermont.

Var. media Bailey Mem. Torr. Bot. Club 1, 73. Rather stiff, 4-12 inches high, in dense tufts, most of the stems somewhat exceeding the leaves: staminate spike prominent and erect, 4-5 lines long; pistillate spikes 2-3, all scattered, the lowest peduncled and subtended by a bract which surpasses the stem. In the mountains of eastern Oregon to Montana.

C. umbellata Schk. Reidgr. Nachtr. 75. Closely tufted and matted, stoloniferous: stems filiform, 1-6 inches long, erect or reclining; leaves ½-1½ line wide, usually much exceeding the stems: staminate spike, solitary, terminal 4-6 lines long commonly conspicuous; pistillate spikes 1-3, all filiform peduncled from the basal sheaths or 1 or 2 of them sessile or very nearly so at the base of the staminate, ovoid-oblong, several-flowered, 2-4 lines long; perigynia oval, finely pubescent, pale, obtusely 3-angled, tipped with a subulate 2-toothed beak nearly as long as the body, about as long as the ovate-lanceolate acuminate or short-awned scales. Oregon to the eastern states.

C. globosa Boott Trans. Linn. Soc. xx, 125. Stoloniferous: stems 4-16 inches high, very slender, scabrous, clothed at base with reddish brown sheaths that break up into thread-like fibres: leaves firm, 1-2 lines wide, the lower longer than the stem: lower bracts longer than the spikes: staminate spike 6-12 lines long, a line thick; pistillate spikes oblong, loosely 2-9-flowered, 3-6 lines long, 2 lines thick, the upper sessile and close to the staminate, the others remote and pedunculate, scales oblong or lanceolate, acute or cuspidate, purple with green midrib and hyaline margins: perigynium more or less purple, globose, produced at base, abruptly beaked with a bidentate orifice, hirsute scabrous, broader than the scale. Washington to California.

C. inops Bailey Proc. Am. Acad. xxii, 126. Stems slender, rigid, sharply angled, a foot high, from long and erect rootstocks: leaves numerous, rigid, narrow, long-pointed, about half as long as the stem: spikes 3-4, all aggregated and sessile at the top of the stem, the lowest subtended by a sheathless bract of about its own length, the terminal spike staminate, about an inch long, the others half as long and staminate at the top: perigynia small, elliptic, brown below, very abruptly produced into a white straight and deeply cut beak, scabrous below, hairy on the shoulders and beak, about as long as the brown-centred broad acute scale. On sandy ground among timber on Mount Hood.

TRIBE VIII PHYLLOSTACHYS Carey Gray's Man. 1848, 538. Spikes solitary, staminate above; pistillate flowers few, often remote, usually on a more or less zigzag rachis: scales prolonged and leaf-like or scabrous.

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C. Geyeri Boott Linn. Trans. xx. 118. Stems stiff, slender, 6 inches to 2 feet high, leafy at base: leaves rigid, $\frac{1}{2}$ -1 line wide, carinate, scabrous on the margins and keel: staminate flowers 1-6, alternate, appressed to the rachis: scales whitish, becoming ferruginous, green in the middle, ciliate, in the staminate flowers oblong and obtuse, the pistillate clasping and cuspidate, the lower foliaceous and equalling the stem: perigynia triangular-ellipsoidal, tapering to the base, with a very short entire beak and hyaline orifice, smooth, 1-nerved on the middle of 2 sides, shorter than the scale. On dry ridges, Oregon and Washington to Colorado and Montana.

C. multicaulis Bailey Bot. Gaz. ix. 117. Stems numerous, 1-3 feet high, stiff and wiry, terete or obtusely angled, smooth or minutely scabrous beneath the spike, dark green and remaining so a year after fruiting: leaves short and reduced to sheaths: staminate flowers 3-8, their scales oblong or lanceolate, green with hyaline margins, appressed; pistillate flowers 1-4, their scales green with ovate scarious-margined base and long acuminate tips, sometimes longer than the spike: perigynium large, green, triangular contracted below to a stipitate base, tipped with a short stout beak. On dry ridges among pine timber, southern Oregon to California.

TRIBE IX LAMPROCHLÆNE Drejer Symb. Car. 10. Small mostly boreal species. Spikes mostly solitary. Scales obtuse with hyaline margins. Perigynium smooth, firm in texture, or or even horny, glossy or shining, brown or black, lightly nerved or nerveless, tipped with a short beak. Stigmas mostly 3.

C. Pyrenaica Wahl. Acad. Handl. xxiv. 139. Cespitose, the filiform stems 4-7 inches high, very leafy at base: leaves $\frac{1}{2}$ -1 line broad, flat or often conduplicate: bracts scale-like: spikes dark-brown or purple, ellipsoidal, densely-flowered, 5-8 lines long, 2-4 lines thick, staminate above: scales membranaceous, deciduous, of the staminate flowers linear-oblong, acutish: of the pistillate darker, ovate-lanceolate or oblong-lanceolate, the lowest often cuspidate or subfoliaceous: perigynium membranaceous, lanceolate or spindle-shaped, gradually attenuate to an acute obliquely cut, hyaline-margined orifice, long-stipitate, reflexed at maturity, rather longer than the scale. On the high mountains, northern California to Alaska and the Rocky Mountains.

C. nigricans C. A. Meyer Crup. Nov. t. 7. Stems rather stout, 4-8 inches high, very leafy at base: leaves 1-5 lines wide, not half as long as the stem, flat, attenuate to a very sharp point: spike very dark brown or black, oblong to obovate, 3-6 lines long, staminate at the top: scales oblong to ovate, acute or acuminate: perigynia broadly lanceolate or oblong, abruptly contracted below to a slender stipe, produced above into a slender sharply 2-toothed beak, usually longer than the scale. In wet meadows on the highest mountains, California to Alaska and the Rocky Mountains.

TRIBE X LEPTOCEPHALÆ Bailey Proc. Am. Acad. xii. 131. Spike solitary, staminate above, thin and slender. Perigynia thin in texture, green, oblong, lanceolate or linear in outline, beakless or nearly so.

C. leptalea Wahl. Kongl. Vet. Acad. Handl. (11.) xxiv. 139. Light green and glabrous: stems filiform, erect or spreading, 6-18 inches long: leaves $\frac{1}{2}$ line wide, mostly shorter than the stems: spikes narrowly linear, 2-7 lines long, less than a line thick: perigynia few, linear-oblong, narrowed at base, obtuse and beaked at the summit, $1\frac{1}{2}$ lines long, longer than the attenuate scales. In wet places, California to Alaska and across the continent.

TRIBE XI PHYSOCEPHALÆ Bailey l. c. 132. Spikes solitary,

globular or short-oblong, staminate at top. Perigynia straw-color, papery, more or less inflated. Stamens 3.

C. Breweri Boott Ill. 142, t. 455. Rootstock creeping, stoloniferous: stems 5-18 inches high, obtusely angled, smooth, leafy at base: leaves rigid, filiform, the cauline shorter than the stem: spikes dark fulvous or chestnut-color, oval or ovate, 8-12 lines long, 4-6 lines thick, naked: staminate flowers few: perigynia oval, much inflated and very thin, with a very short obliquely cut entire beak, longer and broader than the hyaline-margined scale. Alpine, California to Washington.

SUBGENUS II VIGNEÆ Koch Syl. Fl. Germ. 748.

Staminate flowers few and inconspicuous, borne at the base or apex of the spikes. Pistillate flowers in one to several short and sessile spikes which are commonly more or less aggregated into heads or even panicles. Cross-section of the perigynium plano-convex in outline. Styles 2. Achenes lenticular.

TRIBE XII ACROARRHENÆ Fries Summa. 78. Staminate flowers borne at the top of the spikes, or the spikes wholly staminate or the plants sometimes dioecious.

§ 1 FETIDÆ Tuckerm. Enum. Meth. 10. Spikes tawny or brown, not elongated, very densely aggregated into a continuous globose somewhat chaffy head. Perigynium ovate or ovate-lanceolate, nerveless or nearly so, mostly thin in texture.

C. vernacula Bail. Bull. Torr. Bot. Club xx, 417. Stems rather stout, triangular, 3-30 inches high, leafy at base: leaves flat, 1-2 lines wide, 1-4 inches long: bract leaf-like, sometimes much longer than the inflorescence: spikes congested into a head 6-20 lines long by 3-8 lines thick, of numerous small roundish ferruginous spikelets, the lower often distinct: scales ovate, acute, cuspidate: perigynia ovate, contracted below to a short stipe and above to a stout bidentate beak, longer than the scale. In the high mountains, Washington to California and the Rocky Mountains.

C. Hoodii Boott Hook. Fl. ii, 211, t. 211. Stems slender, erect, 1-2 feet high longer than the leaves: spikes several to many, very few-flowered, in a dense ovoid or oblong head 6-9 lines long: perigynia spreading, small and narrow, gradually contracted at both ends, green, nerveless or nearly so, conspicuously winged, rough on the angles, about the length of the brown or tawny scales. Oregon and Washington to Montana.

Var. nervosa Bailey Mem. Torr. Bot. Club i, 14. Very tall and slender, 2-3 feet high: head looser: perigynia more conspicuously winged on the outer face. In woods near the coast, Puget Sound to California.

§ 2 VULPINA Kunth Enum. Pl. ii, 383. Spikelets mostly yellow or tawny when mature, densely aggregated or sometimes somewhat scattered below or even panicle. Perigynia thick in texture, spongy at base, mostly stipitate, conspicuously nerved.

C. Jonesii Bailey Mem. Torr. Bot. Club i, 16. Stems slender, erect, somewhat stiff, 7-18 inches high, sharply angled and rough, somewhat exceeding the narrow leaves, spikes several to many, densely aggregated into a small oblong or ovoid naked head an inch or less long: perigynia small, lanceolate from a truncate base, stipitate, very strongly many-nerved, marginless, smooth or but slightly rough on the angles above, the long and brown beak nearly entire, exceeding the brown mucicose or obtuse scale. In the mountains, Washington to California.

C. macrocephala Willd. in Herb. Spring. Syst iii, 808. Stems stout, 3-angled, 4-12 inches high, from long running rootstocks: leaves stiff, 1-4 lines wide, rough on the margins, as long or longer than the stem: spikes densely aggregated into an oblong or ovate head 1-3 inches long by 1-1½ inches thick, subtended by slender bracts: perigynia 6-8 lines long, 2 lines or more thick, ovate from a truncate base, produced above into a subulate deeply 2-toothed beak nearly as long as the body, the angles conspicuously margined with dentate wings, longer than the ovate acuminate scales. On sandy banks along the coast of Oregon and Washington.

C. stipata Muhl. Willd. Sp. Pl. 233. Stems smooth, erect, 1-3 feet high: leaves flat, 3-4 lines wide, shorter than the stem, the upper ones sometimes exceeding the spike: bracts, bristle-like or wanting: spikes numerous, yellowish, crowded into an oblong cluster 1-4 inches long, the lowest sometimes branched: staminate flowers few, always terminal: perigynia lanceolate, 2-2½ lines long, about a line thick at the base, gradually tapering into a rough flattened 2-toothed beak 1-2 times as long as the body, longer than the ovate or lanceolate acuminate hyaline scale. Common in wet places. Brit. Columbia to California and across the continent.

§ MULTIFLORÆ Kunth Enum. Pl. ii, 387. Heads various, mostly loosely flowered, sometimes paniced, yellow or tawny. Spikes short. Staminate flowers sometimes occupying whole spikes in the middle or at the apex of the head. Perigynia mostly small and short, nearly nerveless in some species, becoming nearly lanceolate and more or less prominently nerved, firm in texture.

C. Gayana Desv. Fl. Chile, 205. Stems 1-2 feet high, scabrous: leaves 1-2 lines wide, shorter than the stem: spikes aggregated into an oblong or ovoid head 6-10 lines long by 4-7 lines thick, dioecious or nearly so: scales membranous, chestnut color with hyaline margins, ovate, acuminate, carinate, cuspidate: perigynia chestnut color, broadly ovate, cordate, stipitate at base, tipped with a minute conical beak with an entire orifice, shorter than the scale. Idaho to Colorado.

C. marcidula Boott Hook. Fl. ii, 212, t. 213. Stems slender, 1-2 feet high, scabrous: leaves a line wide, shorter than the stem: heads 8-15 lines long, 3-5 lines thick, sometimes nearly dioecious. dull brown, composed of many ovate crowded or contiguous closely imbricated spikes 2-3 lines long by a line thick, the lower compound, the upper simple: perigynia nearly black at maturity, orbicular with a short, or ovate with a longer, bidentate beak, stipitate, equalling the ovate acute or cuspidate hyaline-margined scale. In meadows, California to Brit. Columbia and Colorado.

Var. *debilis* Bailey Proc. Am. Acad. xxii, 136. Small and slender, a foot or less high, the stems mostly exceeding the very narrow leaves: perigynia smaller and more contracted at base. Along streams, eastern Oregon.

C. teretiuscula Goodn. Trans. Linn. Soc. ii, 163. Stems slender, erect or reclining, very rough, at least above, 1-2 feet long: leaves mostly less than a line wide, shorter than or sometimes equalling the stem: spikes several or numerous, staminate above, in a narrowly oblong compact or interrupted terminal cluster 1-2 inches long: perigynia ovate, smooth, dark brown, slightly more than half a line long, truncate or rounded at base, tapering into a flat conic beak about as long as the body, about equalling the ovate brownish acute or short-awned scales. In swamps and wet meadows, Idaho to Brit. Columbia and Hudson Bay.

Var. *pratensis* Britton. Clusters of spikes compound, branched, the

top commonly nodding. Oregon to Brit. Columbia and the Eastern States.

Var. amplia Bailey Mem. Torr. Bot. Club 1, 53. Very large and stout, 2-3 feet high: heads 1-3 inches long, much branched: perigynia a line or more long, nerved on the back, produced into a long beak. In bogs, Oregon and Washington.

C. vicaria Bailey l. c. 49. Stems 10-30 inches high, slightly scabrous above: leaves 1-2½ lines wide, shorter than the stem: bracts setaceous, exceeding the spike, heads ferruginous, 6-20 lines long by 2-8 lines thick, ovate-oblong or cylindrical, of numerous small roundish crowded spikes or clusters of spikes, the lower often distant: scales ovate, acute, cuspidate: perigynia divergent, membranaceous, ovate, rostrate and bidentate, serrate above on the somewhat winged margins, longer and broader than the scale. In wet places, Oregon to California.

Var. costata Bailey l. c. 49. Perigynia very strongly many-nerved or ribbed on the outer face and usually bearing 3 or 4 nerves on the inner one. Southern Oregon.

§ 4 **ARENARIÆ** Kunth Enum. Pl. ii. 376. Spikes longer, linear or nearly so, aggregated into short almost globose heads. Perigynia lanceolate or ovate-lanceolate, mostly larger and more delicate in texture. Scales very acute or awn-pointed. Staminate flowers variously situated.

C. Douglasii Boott Hook. Fl. ii, 213, t. 213. Rootstocks creeping: stems about a foot high, obtusely angled, smooth: leaves 1-2 lines wide, tapering to an extremely slender triangular point: bracts scale-like, clasping, cuspidate, or the lowest prolonged beyond the stem: heads dioecious or nearly so, oblong, pale or chestnut color, 1-2 inches long, 6-9 lines thick, of many ellipsoidal or ovoid crowded spikes the upper simple, the lower compound and sometimes branching, often half inch long: perigynia ovate or lanceolate-ovate, acuminate to a slender obliquely cut beak, stipitate, shorter than the ample membranous oblong or lanceolate acute or cuspidate hyaline-margined scale: stigmas 2, very long. In alkaline soil, eastern Washington to California.

§ 5 **MUHLENBERGIANÆ** Tuckerm. Enum. Meth. 9. Spikes green or nearly so when mature, aggregated or scattered, never in compound heads. Staminate flowers always borne at the top of the spike. Perigynia mostly short-ovate, usually not conspicuously nerved.

C. tenella Schk. Reidgr. 23. Rootstocks very slender: stems almost filiform, rough, commonly reclining, 6 inches to 2 feet long: leaves soft, about ½ line wide, spreading, shorter than or sometimes equalling the stem: spikes very small, 1-2-flowered, distant, or the upper close together: perigynia ovoid-ellipsoid, nearly terete, hard, about 1 line long by ½ line thick, tipped with a minute entire beak longer than or equalling the ovate acute hyaline scale: stigmas 2. In bogs, Brit. Columbia to California and the Eastern States.

C. vallicola Dewey Sill. Journ. 2nd ser. xxxii, 40. Stems 6-12 inches high, very slender: leaves ½ line wide, shorter than the stem: bracts roughly cuspidate from a broad hyaline-margined base, the lowest equalling or exceeding its spike: head 6-12 lines long, linear-oblong, of 4-7 narrowly oblong contiguous spikes: scales chestnut-color, membranous, with very broad hyaline margins, acute, or the scabrous keel prolonged into a short mucro: perigynia pale brown, obovate, abruptly attenuate to the base and to the obliquely cut entire beak, about equalling the scales.

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C. nardina Fries Mant. ii, 55. Stems filiform, erect, smooth, 2-6 inches high, very densely tufted: leaves filiform, erect, about as long as the stems: spikes solitary erect, terminal, ovoid-oblong, 3-5 lines long, less than 2 lines thick, bractless: perigynia oblong-elliptic, yellowish-brown, narrowed at both ends, nearly 2 lines long, somewhat hispid above. Beakless, the orifice 2-toothed, equalling or shorter than the brown ovate acute or cuspidate thin scales. Washington to Brit. Columbia and Hudson Bay.

TRIBE xiii HYPARRHENÆ Fries Summa. 72. Staminate flowers borne at the base of the spike or variously situated.

§ 1 ELONGATÆ Kunth Enum. Pl. ii, 402. Spikes silvery-green or sometimes tawny when mature, distinct, mostly small. Perigynia not wing-margined nor conspicuously broadened, mostly nearly flat on the inner face.

C. sterilis Willd. Sp. Pl. iv, 208. Stems slender, stiff, erect or spreading, 8-18 inches long, rough above: leaves $\frac{1}{4}$ -1 line wide, shorter than the stem: bracts very short or sometimes bristle-like: spikes 3-5, subglobose or short-oblong, contiguous or separated, about $2\frac{1}{2}$ lines thick: staminate flowers usually numerous at the base of the upper spike or sometimes whole spikes staminate, rarely quite dioecious: perigynia pale, lanceolate, compressed, spreading or reflexed when mature, $1\frac{1}{2}$ lines long, thickened at base, tapering into a sharp-edged 2-toothed rough beak more than half as long as the body, longer than the ovate hyaline scale: stigmas 2. Common in moist places, California to Alaska and across the continent.

C. canescens L. Sp. 974. Pale green and somewhat glaucous: stems slender, erect, roughish above, 10-30 inches high: leaves flat, $\frac{1}{2}$ -1 line wide, shorter than the stem: bracts very short or none, or the lowest bristle-like and longer than its spike: spikes 4-9, short-oblong or subglobose, densely many-flowered, 2-5 lines long, about 2 lines thick, scattered or the upper close together: staminate flowers basal: perigynia oval, silvery-green to nearly white, rather less than a line long, about $\frac{1}{2}$ line wide, rough above, tipped with a minute entire beak, equalling or surpassing the ovate hyaline scale. In swamps and bogs, Oregon to Alaska and across the continent.

Var. *Oregana* Bailey Mem. Torr. Bot. Club i, 75. Head larger and more dense, becoming brown: spikes loosely flowered, the perigynia sometimes spreading in a stellate manner, narrow, often almost linear-lanceolate, brown-nerved, sharp-edged and rough above. In wet places, Oregon to Vancouver Island.

C. brunneescens Poir. in Lam. Encycl. Supp. iii, 286. Rather dark green, not glaucous: stems slender, stiff, erect, 8-18 inches high: leaves a line or less wide, shorter than the stem, spikes 4-8 subglobose or short-oblong, few-flowered, rarely over $2\frac{1}{2}$ lines long, scattered or the upper close together: staminate flowers basal: perigynia ascending or spreading, brown, less than a line long, tipped with a beak about $\frac{1}{2}$ as long as the body, about equalling the ovate membranous brownish scale. In wet places, Oregon to Brit. Columbia and the Eastern States.

C. areta Boott Ill. 155, t. 497. Rather light green but not glaucous: stems slender, erect, 12-30 inches high, rough above: leaves flat, a line wide, shorter than or equalling the stem: spikes oblong, many-flowered, 3-4 lines long, about $2\frac{1}{2}$ lines thick, all aggregated into a terminal ovoid cluster: staminate flowers basal: perigynia pale, ovate, mostly spreading, tapering into a rough beak about half as long as the body, longer than the

membranous pale brown scale: stigmas 2. In swamps and wet woods, Oregon to Brit. Columbia and across the continent.

C. Deweyana Schwein. Ann. Lyc. N. Y. i, 65. Stems slender, spreading, nearly or quite smooth, 1-2 feet long: leaves 1-2 lines wide, flat, soft, shorter than the stem: spikes 3-6, oblong or subglobose, few-flowered, 2-3 lines thick, distinctly separated or the upper ones contiguous: staminate flowers basal: perigynia lanceolate or ovate-lanceolate, thin, tapering above to a rough strongly 2-toothed beak half as long as the body, equaling the hyaline-margined broadly ovate acute or cuspidate scale: stigmas 2. In wooded districts, California to Alaska and across the continent.

Var. Bolanderi W. Boott Bot. Cal. ii, 236. Stems stouter and leaves broader: spikes 4-10, with more numerous flowers: scales hispid-awned. With the type, Washington to California.

§ 2 **OVALES** Kunth Enum. Pl. ii, 394. Spikes tawny or dark, rather large, sometimes crowded. Perigynia with a more or less winged margin which is mostly incurved at maturity making them concave.

C. siccata Dewey Am. Journ. Sci. x, 278. Rootstock long and stout: stems slender, erect, 1-2 feet high: leaves about a line wide, the upper sometimes exceeding the stem, the lower short: bracts short or the lower bristle-like and elongated: spikes 3-6, oblong or subglobose, 3-4 lines long, brownish, clustered or more or less scattered: staminate flower variously situated or whole spikes staminate: perigynia ovate-lanceolate, less than 3 lines long, wing-margined, tapering to a rough beak nearly as long as the body, about equalling the ovate-lanceolate membranous acute or acuminate scale: stamens 2. In dry ground, California to Brit. Columbia and New York.

C. pratensis Drejer Rev. Crit. Car. 24. Stems slender, erect when young, the summit at length nodding, 12-18 inches high: leaves about 1 line wide shorter than the stem: spikes 3-6, oblong or club-shaped, scattered or the upper contiguous, silvery-brown, shining, 3-5 lines long, less than 3 lines thick, several-flowered: staminate flowers basal: perigynia lanceolate, thin, pale, wing-margined, tapering into a beak nearly as long as the body, about as long as the lanceolate acute or acuminate membranous scale: stigmas 2. Eastern Oregon to Alaska, Labrador and the Rocky Mountains.

C. stramineiformis Bailey Mem. Torr. Bot. Club i, 24. Stems 6 inches to 2 feet high, obtusely angled, nearly smooth: leaves flat, 1-2 lines wide, shorter than the stem: heads variegated, pale green and chestnut, 6-12 lines long, 6-10 lines thick, oblong, triangular-ovoid or subspherical, of 3-8 crowded ellipsoidal spikes: scales chestnut-color, pale in the middle with narrow hyaline margins ovate, acute: perigynia broadly ovate or roundish, abruptly attenuate to a sharp minutely bidentate beak, broadly wing-margined to the base, the wings finely serrate, longer and broader than the scales. In dry soil on the high mountains, Washington to California.

C. feta Bailey Bull. Torr. Bot. Club xx, 417. Stems slender, 1-3 feet high: leaves 2 lines wide, shorter than the stem: heads ovoid or oblong, of 4-12 crowded or contiguous, spikes, naked or the lowest with a setaceous bract with a dilated base: perigynia pale fulvous, lanceolate, attenuate rather sharply bidentate, winged, nearly 2 lines long, broader than the membranous fulvous lanceolate acuminate scales. In swales, Washington to California.

C. leporina L. Sp. 973. Stems slender, erect, roughish above, 12-18 inches high: leaves about 1 line wide, flat, shorter than the stems: bracts

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Stems erect when young: leaves about 1 line wide, club-shaped, scabrous. 3-5 lines long, less than 3 lines long as the basal: perigynia nearly as long as the body, imbricate membranous. Oregon and the Rocky

Stems 6 inches high, 1-2 lines wide, and chestnut, 6-12 lines long, sub-spherical, or sub-globose, broadly ovate or ovate beak, longer and broader than the body. Washington to Calif.

Stems slender, 1-3 feet high, ovoid or oblong, or sub-globose, at with a setaceous beak, attenuate broader than the body, Washington

Stems 12-18 inches high, the stems: bracts

very short and scale-like or wanting: spikes 4-7, oblong, obtuse, narrowed and staminate at base, 4-6 lines long, about 3 lines thick, dark brown, shining, clustered but distinct in a terminal oblong head about an inch long: perigynia erect or ascending, ovate-lanceolate, 2 lines long, rather narrowly winged, the rough tapering 2-toothed beak nearly as long as the body, longer and broader than the lanceolate acute membranous scale. Oregon to Brit. Columbia and the Rocky Mountains.

C. festiva Dewey Sill. Journ. xxix, 246. Cespitose: stems 6 inches to 2 feet high, sharply angled: leaves 3-5, the upper longest, commonly shorter than the stem, 2-3 lines wide; heads dark ferruginous, 9-12 lines long, 3-12 lines thick, of from 6-12 or more nearly equal roundish or ovoid spikes, contiguous in an oblong, or crowded in a spherical or ovoid cluster, naked or subtended by a scale-like or foliaceous bract that sometimes exceeds the stem; perigynia membranous, spreading or divergent, ovate, lanceolate or narrowly elliptical, attenuate to a longer or shorter obliquely cut beak, narrowly winged, serrate above on the sharp margins, longer than the scale. In moist meadows, California to the Arctic regions and the Rocky Mountains.

Var. gracilis Olney Proc. Am. Acad. viii, 407. Stems very slender, nodding at the top, 20-30 inches high: heads oblong, 12-18 lines long, of 3-6 roundish contiguous or approximate ferruginous spikes. Washington to California.

Var. stricta Bailey Mem. Torr. Bot. Club i, 51. Stems rather stiff 20-30 inches high: leaves stiff and the lower ones short: heads very dense globular or short-ovoid, light brown, 9-12 lines long: perigynia broad more or less nerved. In wet places, eastern Oregon to California.

Var. pachystachya Bailey l. c. Stems 1-3 feet high, flat and weak, longer than the lax leaves: heads small, globular or oblong, dull dark brown, the spikes often somewhat distant, very short: perigynia spreading, about equalling the ovate-lanceolate mucicose brown scales. Oregon to Alaska and Montana.

C. athrostachya Olney Proc. Am. Acad. viii, 393. Cespitose: stems acutely triangular, leafy, 8-24 inches high: leaves narrow, shorter than the stem: bracts with an expanded strongly nerved hyaline-margined base, the lower 3-5 foliaceous, much exceeding the stem: heads globose, straw-color, of 5-20 densely crowded spikes or the lowest distant: scales, membranous, pale ferruginous, ovate-lanceolate, acuminate: perigynia, ovate-lanceolate, attenuate to an elongated sharply bidentate beak, the winged margins serrate, about as long as broad as the scale. In the mountains of California to Brit. Columbia and the Rocky Mountains.

ORDER CIX GRAMINEÆ Juss. Gen. 28. (1789)

Annual or perennial plants with usually hollow cylindrical, rarely flattened, jointed stems with closed nodes, two-ranked usually linear parallel-veined leaves with sheathing base, the sheaths open on the side opposite the blade, and usually a scarious or cartilaginous ring called the ligule at the orifice of the sheath, and small flowers in spikelets which are arranged in panicles, racemes or spikes, and which consist of a shortened axis called the rachella, and two or more chaff-like distichous imbricated scales called glumes of which the first two are usually empty, in the axil of each of the others, except sometimes in the uppermost, is borne a flower and a two-nerved scale called

the palet, with its back turned toward the rachella and often enveloping the flower by its enfolded edges: at the base of the flower between it and its glume are usually two very small hyaline scales, called lodicules. Stamens 1-6, usually 3, with very slender filaments and two-celled usually versatile anthers. Pistil with a one-celled one-ovuled ovary and one to three, usually two styles with variously branched mostly plumose stigmas. Embryo small, situated at the base of the seed and covered only by the thin pericarp. Fruit a caryopsis, usually called a grain, with copious mealy albumen.

SUBORDER I PANICACEÆ R. Br.

Spikelets 1- or 2-flowered, when 2-flowered the upper fertile, the lower staminate. Rachella articulated below the glumes or the subtending involucre, not extending beyond the flower.

TRIBE I ANDROPOGONEÆ Spikelets perfect or one staminate or rudimentary, mostly silky. Flowering glumes and palet hyaline, none of the glumes spiny.

- 1 *Imperata* Spikelets in pairs both perfect: empty glumes clothed with long white silky hairs.

TRIBE II PANICEÆ Spikelet of one perfect flower with a staminate or neutral one below it, the latter often reduced to a single palet; sometimes appearing as if one-flowered by the suppression of the lower glume and the palet of the neutral flower.

- 2 *Paspalum* Spikelets apparently 1-flowered, plano-convex, on one side of a flattened rachis, without an involucre.

- 3 *Panicum* Spikelets $1\frac{1}{2}$ -2-flowered without an involucre, the lower usually minute.

- 4 *Chaetochloa* Spikelets 2-flowered, with an involucre of bristles proceeding from the pedicels.

TRIBE III ORYZEÆ Spikelets usually much compressed laterally, one-flowered. Empty glumes two or more. Stamens often 6.

- 5 *Homalocenchrus* Spikelets much flattened: glumes wanting: palet rigid.

SUBORDER II POACEÆ R. Br.

Spikelets not articulated below the glumes, one- to many-flowered, the imperfect flowers if any usually uppermost.

TRIBE IV PHALARIDEÆ Spikelets more or less laterally compressed, 1-3-flowered. Glumes 5, the first 2 below the articulation of the rachella the third and fourth very unlike the others; the fifth with a hermaphrodite flower.

- 6 *Phalaris* Spikelets 3-flowered, the lateral reduced to a rudiment, the fertile coriaceous.

- 7 *Anthoxanthum* Spikelets 3-flowered, the lateral neutral, of a single

awned hairy palet.

- 8 *Hierochloa* Spikelets 3-flowered, the lateral ones staminate.

TRIBE V AGROSTIDÆ Spikelets all hermaphrodite and fertile, with 3-glumes, the first 2 empty. Rachella sometimes prolonged behind the palea into a naked or plumose bristle.

* Flower sessile within the glumes.

- 9 *Coleanthus* Spikelets in small umbellate clusters, all perfect.

- 10 *Sporobolus* Spikelets in contracted or open panicles, all perfect.

* * Flower raised within the glume on a short rounded or stalk-like base.

Glumes long-awned.

- 11 *Polypogon* Glumes much longer than the flower.

+ + Glumes mostly awnless.

- 12 *Agrostis* Lower glumes exceeding the very thin obtuse palea: inflorescence spike-like to open panicle.

- 13 *Gastridium* Inflorescence spike-like: glumes with a shining ventricose base.

- 14 *Clina* Flower distinctly stipitate: flowering glume short-awned below the tip.

- 15 *Andropogon* Flowers mostly bearded at base, early deciduous: flowering glume awned from the apex.

+ + + Flowers with a more or less conspicuous tuft of hairs at base, shorter than the glumes.

- 16 *Calamagrostis* Spikelets 2-flowered and mostly with the rudiments of a second flower present: palea awned from below the apex.

TRIBE IV CHLORIDÆ Spikelets one, to several-flowered, in simple one-sided spikes upon a jointless rachis.

* Spikelets one-flowered.

- 17 *Spartina* Spikelets much flattened laterally, in 2 rows upon one side of a 3-angled rachis: spikes racemed.

- 18 *Beckmannia* Spikes paniced: spikelets 2-flowered, or by abortion 1-flowered, upon one side of a flattened rachis.

* * Spikelets 2-flowered or more, one flower perfect with one or more imperfect or neutral ones above it.

- 19 *Bouteloua* Flowering glumes 3-cleft and 3-awned at the apex: imperfect flowers often reduced to these awns.

- 20 *Eleusine* Spikes digitate at the summit of the stem: spikelets several-flowered.

TRIBE V STIPACÆ Spikelets strictly one-flowered. Flowers with a sharp-pointed callus at base, deciduous. Flowering glume wrapped around the flower and palea, coriaceous and indurated in fruit and terminated by a simple or triple awn.

- 21 *Stipa* Awn simple, long, twisted below, not caducous.

- 22 *Oryzopsis* Awn simple, caducous: flower clothed with long silky hairs.

- 23 *Aristida* Awn triple, continuous or articulated with the glume.
 24 *Phleum* Panicle dense and spike-like: glumes distinct: awn simple.
 25 *Alopecurus* Panicle spike-like: glumes more or less united at base: awn simple.

TRIBE VI AVENACEÆ Spikelets panicled 2-several-flowered, rachis often bearded, prolonged into an imperfect rudiment. Glumes mostly equalling or exceeding the flower. Flowering glumes usually bearing an awn on its back or between its teeth.

* Spikelets with 2 or more lower flowers perfect.

- 26 *Danthonia* Spikelets several-flowered, awned from the 3 united middle nerves.
 27 *AVENA* Spikelets 2-flowered, awned from the midnerve only.
 28 *Trisetum* Spikelets 2-several-flowered: flowering glume 2-toothed at the summit, awned from the midnerve only.
 29 *AIRA* Spikelets 2-flowered, both perfect, the rachella not prolonged beyond the upper one.
 30 *Deschampsia* Spikelets with 2 perfect flowers, the rachella prolonged beyond the second flower.

** Spikelets 2-flowered with one flower staminate

- 31 *ARRHENATHERUM* Lower flower staminate, upper perfect and usually awnless.
 32 *HOLCUS* Lower flower perfect, awnless, upper staminate and awned.

TRIBE VII FESTUCEÆ Spikelets panicled, 2-many-flowered, the rachis usually prolonged and bearing an imperfect flower or bristle.

* Lower one or two flowers staminate or neutral.

- 33 *Munroa* Spikelets in clusters in the axils of the upper leaves, with the two lower glumes empty.
 34 *Phragmites* Spikelets in an ample panicle, with one staminate flower below 2-4 perfect ones: rachis bearded with long hairs.

** Lowest flowers all perfect: grain not adherent to the palea.

+ Flowering glumes pointed, awned or acute, the nerves, when present, running into the point.

- 35 *DACTYLIS* Spikelets in dense one-sided clusters in a one-sided panicle: glumes herbaceous, compressed, awn-pointed.
 36 *Koeleria* Spikelets in a dense spike-like panicle: glumes membranous, keeled, pointed or mucronate.

+ + Flowering glumes pointless and, except in *Melica*, awnless, obtuse; the nerves parallel.

++ Flowering glume 1-nerved; the palea 2-nerved.

- 37 *Eatonia* Glumes very unlike; the upper one much broader than the linear lower one and wrapped around the flower.

++ One or two of the glumes 5-nerved or more.

- 38 *Melica* Flowering glumes flattish on the back, 7-nerved or more, membranaceous at tip: fertile flowers 1-3, the upper enwrapping the

- 1-3 imperfect ones.
- 59 *Distichlis* Flowers dioecious: flowering glumes much compressed laterally, many-nerved, somewhat coriaceous.
* * * Glumes 1-3-nerved.
- 40 *Catabrosa* Glumes membranous, erose-truncate.
- 41 *Grappheporum* Rachella hirsute with stiff hairs, extended into a hairy appendage: flowering glumes membranous.
- 42 *Panicularia* Spikelets several-flowered deciduous, the rachella breaking up into joints: flowering glumes rounded on the back, the 5-7 nerves not reaching the scarious mostly obtuse apex.
- 43 *Puccinellia* Flowering glumes chartaceous, convex on the back, faintly 2-nerved, the nerves not reaching the obtuse subdentate or or mucronulate apex.
- 44 *Pleurapogon* Flowering glumes chartaceous, several-nerved, the nerves not reaching the truncate awned apex.
- 45 *Poa* Flowering glumes laterally compressed, mostly keeled, 5-nerved, membranous, the margins or nerves below with cobwebby hairs or pubescent: palea falling with the glume.
- 46 *Eragrostis* Flowering glume 3-nerved, keeled, deciduous, leaving the persistent palea.
- * * * Spikelets several-flowered: lowest flowers all perfect: grain adherent to the palea.
- 47 *Briza* Spikelets somewhat heart-shaped: flowering glumes rounded, many-nerved, becoming ventricose.
- 48 *Festuca* Spikelets flattish: flowering glumes rounded on the back, few-nerved, pointed or awned at the tip: ovary mostly smooth.
- 49 *Bromus* Spikelets flattened: flowering glumes convex to compressed, mostly awned below the tip: ovary pubescent.
- TRIBE VIII HORDEAE Spikelets one- to several-flowered, sessile in alternate notches on the opposite sides of a zigzag rachis, either solitary or several together.
- * Spikelets single at each joint of the rachis.
- 50 *Scribneria* Spikes slender, solitary: spikelets 1-flowered, almost embedded in the notches of the rachis.
- 51 *Lolium* Spikelets several-flowered, placed with the edge next to the rachis: the inner glumes wanting except the terminal one.
- 52 *Agropyron* Spikelets 3- to several-flowered, placed flatwise on the rachis: both glumes present, standing right and left.
- * * Spikelets 2 or more at each joint of the rachis: glumes anterior, forming a sort of involucre to the spikelet.
- 53 *Hordeum* Spikelets 1- to several-flowered, in three's at each joint: lateral spikelets usually sterile.
- 54 *Elymus* Spikelets 1- to several-flowered, 2-4 at each joint, all perfect and similar: glumes shorter than the spikelets: flowering glumes not long-awned.
- 55 *Sitanion* Spikelets 1- to several-flowered, 2-4 at each joint, all perfect: glumes very long, usually 2-parted to the base and long-awned: flowering glumes long-awned and 2-toothed, or 3-awned.

SUBORDER 1 PANICACEÆ R. Br. Verm. Schr. i, 114.

Spikelets one- or two-flowered, when two-flowered the second or terminal one is perfect and the lower one staminate or neutral. Rachella articulated below the empty glumes the spikelets falling from the pedicels entire either singly or in groups or with the joints of an articulated rachis.

Tribe 1 Andropogoneæ. Spikelets in spike-like racemes, 2 at each joint of an articulated rachis, one sessile and hermaphrodite, the other pedicellate and either hermaphrodite, staminate, neutral or or reduced to the pedicel only. glumes usually 4, the first 2 empty, larger and much firmer in texture than the others; the third usually with a staminate flower in its axil; the fourth hyaline with a fertile flower in its axil, usually awned. Awn usually twisted or geniculate.

1 IMPERATA Cyrill Pl. Rar. Ic. ii, 26. (1796.)

Panicle spike-like. Spikelets in pairs on unequal short clavate pedicels or one sessile, both perfect, awnless. Outer empty glumes clothed with long white silky hairs: third and fourth glumes and palet hyaline. Stamens 1 or 2. Stigmas 2.

I. Heckeri Rupr. *Elfers* Vet. Acad. Stockh. 160. Stems 2-4 feet high, simple, smooth, from creeping rootstocks: radical leaves 4-12 inches long, the cauline shorter, decreasing upward: ligule short, ciliate: panicle nearly cylindrical, erect, 6-12 inches long, sometimes interrupted below: hairs dense, straight, about $\frac{1}{4}$ inch long, giving the peculiar feathery appearance, flecked with the yellow or brown anthers and stigmas. Along streams, eastern Oregon and Nevada to California and Texas.

Tribe 2 Panicæ. Spikelets hermaphrodite, terete or flattened on the back. Glumes 2-4, when 4 there is sometimes a staminate flower or palea in the axil of the third. Axis of the inflorescence not articulated; the rachella being articulated below the glumes, the spikelets falling off singly from their pedicels.

5 PASPALUM L. Syst. ed. 10, ii, 855.

Spikes or racemes either solitary, few and digitate or many and panicle. Spikelets in 2-4 rows upon one side of a flattened or filiform jointless rachis, jointed upon their short pedicels, plano-convex, awnless, apparently one-flowered. Glumes 2, nearly equal, few-nerved. Flowering glumes roundish or ovate, coriaceous, convex and enclosing the palet. Scales 2. Stamens 3. Ovary smooth. Grain enclosed in the glume.

P. distichum L. *Amon.* Acad. v, 391. Rootstock widely creeping, perennial: stems 6-18 inches high, clothed below with the somewhat crowded sheaths: leaves flat, 2-3 inches long, glaucous, rough above: spikes 2, spreading, one sessile, the other peduncled, 1-1½ inches long, densely flowered: spikelets in 2 rows, ovate, acute, 1½ lines long: glumes 3-nerved, more or less pubescent. In moist meadows Oregon to California and the southern Atlantic States: also in Europe.

3 PANICUM L. Sp. 55.

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* Spikelets in pairs, one sessile the other pedicelled, crowded on one side of simple flattened branches which are digitately clustered at the top of the stem: lower flower neutral, of a single palet.

P. sanguinale L. Sp. 57. Stems erect or decumbent, 1-3 feet long, often rooting at the lower nodes, smooth: leaves 2-6 inches long, 2-4 lines broad, acuminate: spikes 3-10, narrowly linear, 2-6 inches long, digitate or in approximate whorls at the summit of the stem: rachis flat, margined: spikelets lanceolate, acute. In fields and waste places throughout North America and Europe except the extreme north.

* Spikelets disposed in panicles, awnless.

+ Annual.

P. capillare L. Sp. 58. Stem erect or decumbent, 1-2 feet long, simple or sometimes branched: sheaths pilose-hirsute: leaves 6-12 inches long, 3-8 lines broad, more or less pubescent: terminal panicle 3-14 inches long, its lower branches at first included in the upper sheaths, finally exserted and widely spreading, 2-10 inches long: spikelets 1-1½ lines long, acuminate. In dry soil, throughout most parts of North America and Europe.

+ + Perennials.

P. pubescens Lam. Encycl. iv, 748. Stems at first erect and simple, later profusely branched and leaning or ascending: sheaths hirsute to villous, often papillose: leaves rounded-truncate or often narrowed at base, those of the stem 2-3 inches long, those of the branches much shorter: primary panicle less than 3 inches long, ovoid, the branches ascending: spikelets hardly a line long, pubescent. In dry soil, eastern Washington to the Eastern States.

P. dichotomum L. Sp. 58. Smooth and glabrous or the lower nodes bearded: stems erect, 6-24 inches high, at first simple, later profusely dichotomously branched at about the middle: leaves light green, generally much narrowed toward the base, the primary ones distant, 2-3 inches long by 2-3 lines broad, those of the branches much smaller, sometimes involute: primary panicle usually long-exserted 1-2 inches long, the branches loose and spreading, bearing few glabrous ellipsoid spikelets about a line long. In dry woodlands, Washington to the Eastern States.

P. Scribnerianum Nash Bull. Torr. Bot. Club xxii, 421. Stems erect, 6-24 inches high, simple or later in the season dichotomously branched above, sparingly pubescent: sheaths shortly papillose-hispid, sometimes glabrate: leaves 2-4 inches long, 3-6 lines broad, rounded or truncate at base, acuminate, more or less spreading, smooth above, scabrous beneath: panicles small, the primary one exserted, ovoid, 1-3 inches long, its branches spreading 8-12 lines long, often flexuous: spikelets turgid obovoid, about 1½ lines long. In dry or moist soil, eastern Washington to the Eastern States.

P. Scoparium Lam. Encycl. iv, 744. ? Stems spreading, 6-24 inches long, geniculate at the lower nodes and at length branched: leaves lanceolate, 3-5 inches long, 4-6 lines broad, mostly erect and somewhat rigid; hairy beneath and fringed with spreading hairs at base: sheaths hairy panicle 2-3 inches long nearly simple, the simple branches bearing a few

large tumid obovate usually hairy spikelets $1\frac{1}{2}$ lines long. Common in open places, Washington to California.

* * * Spikelets crowded in 3-4 rows or irregularly on one side of the spike-like branches of the panicle.

P. CRUS-GALLI L. Sp. 56. Stems stout, 1-4 feet high, often branching at base: sheaths smooth and glabrous: leaves 6-20 inches long, $\frac{1}{4}$ -1 inch broad, glabrous, smooth or scabrous: panicle composed of 5-15 sessile erect or ascending branches, or the lower branches spreading or reflexed: spikelets ovate, green or purple, densely crowded, the glumes more or less awned. Common in fields and waste places throughout North America: naturalized from Europe.

4 CHÆTOCHLOA Scribn. U. S. Dept. Agr. Div. Agros. Bul. 4, 38.

Mostly annual grasses with erect stems, flat leaves and spike-like panicles. Spikelets 1-flowered or rarely with a second staminate one. Rachella with bristles below the articulation. Spikelets with 4 glumes, the 3 outer membranous, the third often subtending a palet and rarely a staminate flower, the fourth chartaceous, subtending a palet of similar texture and a perfect flower. Stamens 3. Styles distinct, elongated. Stigmas plumose. Grain free, enclosed in the glume:

C. VIRIDIS Scribn. l. c. 39. *Setaria viridis* Beauv. Stems erect or ascending, 1-3 feet high, simple or branched: sheaths glabrous: leaves 3-10 inches long, 2-6 lines wide: spikes 1-4 inches long: spikelets about a line long, elliptical, much shorter than the upwardly barbed bristles. In waste places and cultivated fields, throughout North America: introduced from Europe.

Tribe 3 *Oryzæ* Kunth Enum. i, 5. Spikelets usually much compressed laterally, 1-flowered, staminate, pistillate or hermaphrodite. Empty glumes 2 or none, the flower being subtended by the floral glume and palet alone. Stamens frequently 6. Axis of the inflorescence not articulated.

5 HOMALOCENCHRUS Mieg.; Hall Hist. Stirp. Helv. ii, 201.

Panicle loose, its base often enclosed by the upper sheath. Spikelets much flattened, more or less crowded and overlapping each other, awnless, 1-flowered. Glumes only one, hard, strongly flattened laterally, fringed on the keel with bristly hairs, 3-nerved. Stamens 1, 3, or 6. Ovary smooth. Styles short. Stigmas plumose with branching hairs. Grain flat, enclosed by the glume.

H. *oryzoides* Poll. Hist. Pl. Palat. i, 52. Stems 2-3 feet high: leaves flat, spreading, 6-8 lines wide, very rough upward: panicle much branched, spreading, 6-8 inches long: spikelets $2\frac{1}{2}$ -3 lines long, pale green: stamens 3. In wet places, eastern Oregon to California and the Atlantic States.

SUBORDER II POACEÆ R. Br. Verm. Schr. i, 115.

Spikelets one- to many-flowered, the imperfect or rudimentary flowers if any uppermost. Rachella usually articulated above the empty glumes so that these are persistent. In spikelets with 2 or more flowers the rachella is usually articulated below each flowering glume.

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Tribe 5 Phalaridæ Kunth Enum. 118. Spikelets more or less laterally compressed, 1-3-flowered. Glumes 5, the first 2 empty and below the articulation of the rachella, the third and fourth usually empty, very unlike the outer ones, rarely subtending staminate flowers, sometimes reduced to mere bristles; the fifth glume with a 1-nerved or nerveless palet and a hermaphrodite flower.

6 PHALARIS L. Sp. 54.

* Panicle dense and spike-like: glumes keeled.

P. CANARIENSIS L. Sp. 54. Stems 1-3 feet high, from an annual root; leaves flat, with the upper sheaths much inflated: spikes 1-2 inches long, ovoid or somewhat cylindrical, very dense: glumes broad, with a conspicuous keel with a distinct green line within it: rudimentary flowers represented by small smooth lanceolate scales: perfect flowers with minute silky hairs in fields and waste places: introduced from Europe.

P. CAROLINIANA Walt. Fl. Car. 74. P. intermedia Bosc. Stems 6 inches to 4 feet high, smooth, from an annual root: leaves short, an inch long or less, often glaucous; sheaths inflated: spikes 1-2 inches long, dense: spikelets 3 lines long: glumes with a broad keel, pointed rudimentary flowers linear, hairy, less than half as long as the perfect one which is long-pointed, hairy and one third shorter than the glumes. In waste places, Oregon to California and the southern Atlantic States.

P. AMETHYSTINA Trin. Phalarid. 10. Stems rather slender, 2-3 feet high, from a perennial root: leaves often purplish, short, the sheaths inflated: spikes oblong, 1-2 inches long, usually purplish: spikelets 2 lines long or more: glumes but slightly keeled: rudimentary flowers hairy, more than half as long as the hairy perfect one. Along the coast, southern Oregon to Calif.

* * Panicle branched: glumes not keeled.

P. ARUNDINACEA L. Sp. 55. Stems 2-6 feet high, from creeping perennial rootstocks: leaves 3-20 inches long, 3-8 lines wide smooth panicle 4-8 inches long, its rough branches erect or somewhat spreading: spikelets 2 lines long, ovate: glumes pointed, 8-nerved, not keeled: rudimentary flowers reduced to narrow silky scales, one-third as long as the perfect one which is smooth or silky and one-third shorter than the glume. Common in low grounds California to Brit. Columbia and the Atlantic States: also in Europe and Asia.

7 ANTHOXANTHUM L. Sp. 28.

Panicle cylindrical, spike-like. Spikelets 3-flowered, the lateral flowers neutral and consisting of a single palet; the upper or central one perfect. Glumes thin, unequal, the lower smaller, 1-nerved, the upper about twice as long as the lower and 3-nerved. Palets of neutral flowers usually awned. Stamens 2. Ovary glabrous. Stigmata feathery. Grain ovate, enclosed by the glume.

A. ODORATUM L. Sp. 58. Stems erect and rather slender, 1-2 feet high, from a perennial root: leaves flat hairy: sheaths often hairy; the ligule short and obtuse: panicle 1-6 inches long, interrupted below, often brownish: spikelets 3-4 lines long: neutral palets 2 lobed, hairy, one with a bent awn from near the base, the other short-awned below the tip: whole plant pleasantly scented when drying. Common in lawns and waste places: introduced from Europe.

8 HIEROCHLOE Gmelin Fl. Sib. i, 101.

Panicle loose and spreading. Spikelets laterally compressed, 3-flowered, the 2 lower or lateral ones staminate, the upper or central one perfect. Glumes 5, the first and second about equal, acute, glabrous; the third and fourth somewhat shorter, obtuse, entire, emarginate, 2-toothed or 2-lobed with or without an awn, enclosing a palea and stamens; the fifth often produced into a short awn, enclosing a palea and perfect flower. Stamens 3 in the staminate flowers, 2 in the perfect one. Styles distinct. Stigmas plumose. Grain free, enclosed by the glume.

H. macrophylla Thurber: Bolander in Trans. Cal. Agr. Soc. 1864-65, 139. Stems 1-3 feet high forming large loose tufts, with leaves 12-18 inches long by 4-10 lines wide, rough on the upper surface and margins: panicle with rather distant branches in pairs: glumes greenish along the very distinct nerves, obtuse and barely equalling the staminate flowers, the lower paleas of which are strongly fringed on the margins, notched at the apex and often with a slight mucro or awn: perfect flower pubescent toward the apex, otherwise smooth and shining; the flowering glume very obtuse and fringed on the margins. In forests, western Washington to California.

H. borealis R. & S. Syst. ii, 513. Stems 1-2 feet high, erect simple, smooth: lower leaves elongated, 4-8 inches long, 1-3 lines wide, scabrous, the upper ones $\frac{1}{2}$ -2 inches long: panicle 2-4 inches long, its branches 1-2 inches long, usually spreading, naked below: spikelets yellowish-brown and purple, 2-3 lines long: lower glumes glabrous; flowering glumes villous and strongly ciliate, entire, awn-pointed: paleas villous at the apex. Along streams, Oregon to Alaska and the northern Atlantic States.

Tribe V Agrostidæ. Spikelets all hermaphrodite, one-flowered, with one pair of empty glumes, or these rarely wanting, usually as long as or exceeding the flowering glumes. Rachella sometimes prolonged behind the palea into a naked or plumose bristle.

9 COLEANTHUS Seidel Reichenb. Incon. Fl. Germ. i, 177.

Panicles simple or branched, the flowers in umbellate clusters of short 1-flowered rays. Empty glumes wanting: flowering glume membranous, 1-nerved, acuminate awned. Palea shorter than the glume, with 2 divergent nerves, keeled, bifid at the apex, the divisions acuminate: scales none. Stamens 2, with oblong anthers. Ovary sessile, smooth. Stigmas sessile, denticulate with subulate hairs. Grain oblong, somewhat longer than the glumes which are persistent and surround its base.

C. subtilis Seidel l. c. Stems slender, 1-3 inches long, forming loose tufts 1-4 inches in diameter, decumbent and geniculate below, often branched, from an annual root: leaves about 6 lines long, curved, smooth: ligule elongated, acute; sheaths all inflated: panicle 6-18 lines long, its base included in the upper sheath, mostly simple, with 3-4 umbellate clusters, sometimes with one or two short branches with an umbel at the end of each: pedicels longer than the spikelets, scabrous, glumes roughened on the keel. On low muddy flats along the Columbia river; also in northern Europe.

10 SPOROBOLUS R. Br. Prodr. Fl. Hol. i, 169.

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lets 1-flowered. Glumes membranaceo-chartaceous, 1-nerved or nerveless, not awned but sometimes pointed. Flowers sessile, or with a minute callus, usually longer than the glumes. Palets similar to the glumes in texture, mostly 1- or indistinctly 3-nerved. Stamens 2 or 3. Ovary oblong. Stigmas with simple hairs.

S. asperifolius Thurber Bot. Cal. ii, 269. Stems 6-15 inches long, branched, decumbent at base, rooting at the nodes and thus forming broad matted tufts: leaves flat, 1-3 inches long, about 1 line broad, scabrous: ligules very short, truncate: sheaths smooth, loose, very short and overlapping below: panicle included at base, open, 3-5 inches long, pyramidal or ovoid, in outline, its scabrous branches solitary or in pairs: spikelets less than a line long, on pedicels 6 lines long: glumes nearly equal, acute, minutely scabrous: flowers slightly exceeding the glumes, the flowering glume sometimes with a minute mucro at its obtuse tip. In alkaline soil, Brit. Columbia to California and Nebraska.

S. cryptandrus Gray Man. ed. 2, 542. Stems 2-3 feet high, usually geniculate and branched below: sheaths smooth, strongly bearded at the throat, the lower shorter than the internodes: ligules reduced to a mere fringe: leaves flat, 3-8 inches long, about 2 lines wide, acuminate, scabrous above: panicle narrowly pyramidal, more or less enclosed by the upper sheath, 4-8 inches long, its branches mostly in pairs, spreading: spikelets a line long, short-pedicelled, rather crowded, lead-colored: empty glumes somewhat acute, the upper twice the length of the very narrow lower one: flowering glume about equalling the second one. In sandy soil, Oregon to the New England coast.

S. airoides Torr. Pac. R. Rep. vii, 21. Stems 2-3 feet high, somewhat rigid, smooth, forming large tufts, rarely branched, clothed below with dead sheaths: sheaths smooth, with a few long hairs at the throat, the 2 lower overlapping, the uppermost loose: ligules nearly obsolete: leaves very pale, convolute and tapering to a filiform point, the basal ones about half as long as the stems, the uppermost reduced to a mere filiform appendage to the sheath: panicle broadly pyramidal, soon exerted, 6-12 inches long, few-flowered: its slender branches solitary or in pairs, spreading or reflexed: spikelets a line long, brownish, on rather long pedicels: empty glumes rather obtuse, the first narrower and $\frac{1}{2}$ - $\frac{1}{2}$ as long as the second one: flowering glume slightly longer than the second one: palet about as long as the glume. On prairies, eastern Oregon to California and Nebraska.

S. cuspidatus Wood Bot. & Fl. 385. Smooth and glabrous: stems 1-2 feet high, erect, simple or somewhat branched: sheaths shorter than the internodes: ligule a mere ring: leaves 1-4 inches long, less than 1 line wide, erect, involute-setaceous, at least when dry: panicle 2-5 inches long, slender, its branches $\frac{1}{2}$ -1 inch long, appressed: spikelets $1\frac{1}{2}$ -1 $\frac{1}{2}$ lines long: empty glumes acuminate or cuspidate, scabrous on the keel: flowering glume long-acuminate and cuspidate, sparingly scabrous. In dry soil, eastern Washington to the Missouri river.

S. depauperatus Scribn. Bull. Torr. Bot. Club. ix, 103. *Vilfa depauperata* Torr. Stems tufted, very slender, 3 inches to 2 feet long, decumbent and geniculate, often much branched: leaves short, often involute, very minutely scabrous above: sheaths rather loose, crowded and overlapping below: panicle $\frac{1}{2}$ -2 inches long, very narrow, of few solitary distant erect branches: spikelets 1 line long or less, short-pedicelled: empty glumes ovate, obtuse, nearly equal: flower about twice as long as the empty glumes, often blackish, deciduous: flowering glume obscurely 3-nerved, the mid-nerve often excurrent as a small mucro: palet nearly as long as the glume. On margins of ponds, eastern Oregon to California and New Mexico.

S. Bolanderi Vasey Bot. Gaz. xl, 337. Stems slender, about 1 foot long, decumbent below, smooth: ligules short and obtuse: leaves narrow, flaccid, the radical ones about 6 inches long: cauline ones similar, 1-2 inches long: panicle 2-3 inches long, open, lax, its lower branches in twos or threes, filiform, 12-18 lines long: empty glumes unequal, 1-nerved: flowering glume exserted, 5-nerved, softly pubescent on the nerves below. Collected at Multnomah Falls Oregon by Dr. H. N. Bolander.

S. confusus Vasey Beal Grasses N. Am. II, 294. Stems slender, tufted, branching, 3-8 inches high from an annual root: sheaths loose: leaves flat, 6-12 lines long: panicle ovoid or oblong, with loose capillary branches: spikelets less than a line long, smooth, on capillary pedicels 3-4 times as long: empty glumes subequal, obtuse or retuse at the apex: flowering glume but little longer, barely acute. On sandy banks of streams, eastern Washington to California, Colorado and Montana.

S. gracillimus Vasey *Vilfa gracillima* Thurber. Stems capillary, smooth, much branched at base, forming small dense tufts. 3-12 inches high, the leafy portion about 2 inches high: sheaths equalling the internodes, smooth, with hyaline margins: ligules about a line long, obtuse and lacerate: leaves 3-6 lines long, less than a line wide, flat, involute at the apex, very minutely scabrous on the upper side and margins: panicle long-exserted, narrowly linear, few-flowered, interrupted below, its branches in twos or threes, appressed: spikelets about 1 line long: empty glumes subequal, membranaceous, very obtuse, distinctly 1-nerved, mucronate or erose-dentate at the apex: flowering glume 3-nerved, mucronate or tipped with a small awn. Edge of marshes in the high mountains, Oregon to California.

S. simplex Scribn. U. S. Dept. Agr. Bull. 11, 48. A densely caespitose leafy annual, 2-6 inches high: stems slender, smooth: lower sheaths loose, longer than the internodes: ligules a line or more long: leaves flat, 1-2 inches long, scabrous on the margins, very rough near the rigid apex: panicle linear, 1-2 inches long, its scabrous branches erect: spikelets 1 line long: empty glumes subequal, obtuse or truncate, scabrous on the back above, flower twice as long as the glumes: flowering glumes 3-nerved, mucronate pointed, scabrous above. In moist places, Idaho to California and Colorado.

S. filiformis Scribn. l. c. Bull. 17, 173. A very slender densely tufted annual, 3-12 inches high: stems filiform and scape-like, with very short internodes below: leaves filiform, 6-12 lines long: panicle linear, long-exserted spikelets less than a line long: empty glumes subequal, obtuse and mucronate, flowers about twice as long as the empty glumes: flowering glume acute, 3-nerved, scabrous on the midnerve. In moist soil in the high mountains, Washington to California and Utah.

11 POLYPOGON Desf. Fl. Atl. 4, 66. (1798.)

Annual or perennial grasses with flat leaves and numerous flowers in spike-like panicles. Spikelets 1-flowered. Glumes 3, the 2 outer empty, nearly equal, compressed, 1-nerved and bearing a long awn at or below the apex. Flower much shorter than the empty glumes, without manifest callus and naked at base. Flowering glume hyaline, broad, 1-nerved, truncate, toothed, awned at the apex: scales 2, falcate, entire, as long as the ovary. Stamens 3, with small anthers. Styles short, with long feathery stigmas. Grain free, enclosed in the glume and palea.

P. Monspeliensis Desf. l. c. 67. Stems 6-30 inches high erect from a procumbent geniculate base, often branching from the lower nodes: sheaths smooth usually shorter than the internodes: ligules 2-3 lines long, obtuse:

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Stems erect from a
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leaves flat, 2-6 inches long, 1-3 lines wide, somewhat scabrous: panicle 2-6 inches long cylindric or somewhat interrupted, yellowish, dense and soft: empty glumes about 1 line long, obtuse, notched at the apex, bearing slender awns 2-3 lines long; flowering glume much shorter, erose-truncate, bearing a slender awn about $\frac{1}{2}$ line long inserted below the tip. Common in wet places, Brit. Columbia to Mexico and the Atlantic States.

P. littoralis Smith Comp. Fl. Brit. ed. 3, 13. Stems slender, from a perennial root, 1-2 feet long, often decumbent and forming large tufts: ligules 1-3 lines long, acute: leaves narrow, scabrous on both sides: panicle narrow, much lobed its whole length and sometimes completely interrupted below, often purplish: empty glumes scabrous, attenuate above into an awn as long as the body: flowering glume much shorter than the empty ones, obtuse, 2-toothed at the apex: awn 1 line long. In wet places, Oregon to California: also in Europe and South America.

12 AGROSTIS L. Sp. 6.

Annual or perennial grasses with flat or involute leaves and numerous flowers in more or less open panicles with whorled or clustered branches. Spikelets small, one-flowered or sometimes with the rudiments of a second flower. Empty glumes somewhat unequal, the lower usually longest, obtuse or acute, membranous. Flowers mostly shorter than the empty glumes, with a very short naked base. Flowering glume very thin, 3-5-nerved, pointless, naked, often bearing a slender straight awn on the back usually much below the apex. Palea obsolete, or present and shorter than or equalling the ovary, rarely nearly as long as the glume. Stamens mostly 3. Styles 2 distinct, short, with plumose stigmas.

A. equivalvis Trin. Agrost. ii, 116. Stems slender, erect, 1-2 feet high, smooth: sheaths smooth, shorter than the internodes: upper ligules about 1 line long: leaves flat, 4-6 inches long, smooth or nearly so: panicle 2-6 inches long, loose, very narrow, smooth and shining, the branches in whorls of 5 below, in pairs or solitary above, very unequal: spikelets 1-1½ lines long, mostly in pairs: empty glumes nearly equal, acute, 1-1½ lines long: flowering glume acute, 5-nerved: palea about as long as the glume. In moist ground, Alaska to California.

A. ALBA L. Sp. 63. (REDTOP.) Stems slender, erect, often decumbent at base, 6-30 inches high: sheaths smooth: ligules short and truncate or long and acute: leaves flat, 4-12 inches long, smooth or rough: panicle slender, 2-8 inches long; green, red or brownish, its roughish branches usually spreading in flower and more or less contracted afterwards: empty glumes nearly equal, or the lower slightly longest: flowering glume very thin, with some short hairs at base, shorter than the empty ones, rarely with a short awn: palea $\frac{1}{2}$ - $\frac{1}{2}$ as long as the glume. Common in meadows and waste places.

A. exarata Trin. Unifl. 207. Stems 1-3 feet high, erect, sometimes decumbent at base, simple, glabrous: sheaths usually shorter than the internodes: ligules 1-3 lines long: leaves 1-3 inches long, 1-4 lines wide, generally erect, flat or involute, scabrous: panicle contracted, 2-10 inches long, often interrupted, its branches 1-3 inches long, erect or appressed: spikelets crowded, 1-2 lines long: empty glumes subequal, scabrous: flowering glume $\frac{1}{2}$ - $\frac{3}{4}$ line long: palea minute. In moist meadows and along streams, Alaska to California and Nebraska.

A. asperifolia Trin. Mem. Acad. St. Petersburg. ser. 6, 331. Pale green throughout or the inflorescence purplish: stems erect or slightly geniculate below, nearly smooth, 2-3 feet high: sheaths rather loose, smooth, the

lower exceeding the internodes: ligules almost herbaceous, 3-4 lines long, obtuse: panicle rather dense, narrow, erect, 7-10 inches long, its short branches erect: spikelets 1-1½ lines long, narrowly lanceolate, turgid: outer glumes unequal, hispidulous throughout and hispid on the keel: 1-2 lines long: flowering glume broadly oblong, minutely dentate at the truncate apex, thin-membranous, 5-nerved to the apex, ¾ line long: palea minute or wanting. In moist places, Alaska to California.

A. densiflora Vasey Cont. Nat. Herb. 3, 702. A tufted annual: stems erect or geniculate at the lower nodes smooth, 9-12 inches high: sheaths rather loose, nearly smooth, crowded below, longer than the internodes: ligules 2 lines long, obtuse: leaves flat or folded, 2-3 lines wide, hispidulous on both sides, rather thick and rigid, erect tapering to the apex: panicle dense, 2-3 inches long, its scabrous branches glomerate: empty glumes 1½ lines long, nearly equal, acuminate, carinate and hispidulous on the back: flowering glume oblong, truncate, smooth except a minute tuft of white hairs on the ventral side at base, 5-nerved, nearly 1 line long, with or without a slender awn a line or less long near the apex: palea wanting. Washington to California.

A. microphylla Steud. Syn. Pl. Gram. 164. Loosely tufted annual: stems slender, erect, 6-15 inches high, often branched at the base: sheaths nearly smooth, closed, shorter than the internodes: ligules 1-2 lines long, usually lacerate: leaves erect, flat or loosely involute, 1-3 inches long: panicle spike-like 1-3 inches long, light green or purplish, its branches 5-6 lines long: empty glumes nearly equal, 1½-2 lines long, subulate-pointed, hispid on the keel, 1-nerved: flowering glume broadly oblong, 4-toothed at the apex, thin, a line or less long, with a slender awn 2-3 lines long on its back above the middle: palea wanting. In the coast ranges, Oregon and California.

A. grandis Trin. Agrost. ii, 70. Stems erect, 1-2 feet high: sheaths smooth, much shorter than the internodes: ligule about 2 lines long, acute: leaves 2-3 inches long, 1-3 lines wide: panicle usually ample, 4-8 inches long, erect, dense, more or less interrupted below, its short branches erect: empty glumes ovate, acute or acuminate, 1½ line long, the lower one scabrous on the keel: flowering glume similar to the outer ones. In moist meadows, California to Washington.

A. verticillata Vill. Trin. Sp. Gram. i, t. 36. Stems 1-2 feet long, decumbent and taking root below, several of the lower nodes geniculate: sheaths loose, shorter than the internodes: ligules truncate, 1-2 lines long: leaves short, flat, 1-3 lines wide, roughish on the upper surface and margins: panicle 2-6 inches long, dense and spike-like, lobed and interrupted, its short branches crowded and spikelet-bearing from the base: empty glumes about equal, acute, roughened with minute pubescence: flowering glume about half as long as the outer ones, 5-nerved and minutely 5-toothed at the obtuse apex: palea nearly as long as the glume. In ditches and wet places, southern Oregon to California and Texas.

A. tenuiculmis Nash *A. tenuis* Vasey. Loosely tufted: perennial: stems slender, 6-10 inches high, somewhat geniculate below: leaves 1-2 inches long, narrow, about 2 on the stem: ligules short: panicle pyramidal, open, 2-3 inches long, its capillary branches in threes or fives below, the longest an inch or more long, spreading or ascending: spikelets less than a line long: empty glumes acute, purplish, the lower one a little shorter and broader: flowering glume thin, obtusish, 3-nerved above, a little shorter than the outer ones, not awned: palea very minute or wanting. On dry ridges, California to eastern Washington.

A. Pringlei Scribn. Am. Grasses i, 156. Stems erect or ascending, 1-2 feet long, from a stoloniferous perennial base: leaves flat, narrow, rather rigid: panicle narrow, loosely flowered, 3-8 inches long: empty

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glumes about 2 lines long, acuminate-lanceolate, scabrous on the keel: flowering glume much shorter than the outer ones, densely hairy at base, obtuse, not awned. On the plains of southeastern Oregon to California.

A. canina L. Sp. 62. Stems slender, erect, 1-2 feet high, simple, smooth: sheaths shorter than the internodes: ligules 1- $1\frac{1}{2}$ lines long: leaves 1-3 inches long by a line wide, scabrous: panicle 2-7 inches long, contracted in fruit, its slender branches ascending or spreading in flower: spikelets a line long, on appressed pedicels: empty glumes subequal, acute, strongly scabrous on the keel: flowering glume about $\frac{3}{4}$ as long as the outer ones, obtuse, smooth, bearing a straight or somewhat bent awn on the back just above the middle: palet minute or none. In meadows, Alaska to California and Pennsylvania.

A. Hallii Vasey Contr. Nat. Herb. 3, 74. Stems erect, simple, stout, smooth, 2-3 feet high: sheaths slightly roughened, usually crowded below: ligules acute, 2 lines long: radical leaves numerous, mostly involute, 3-6 inches long, 1-2 lines wide: panicle 6-9 inches long, narrow, its branches in clusters of 5-10, slender, scabrous, erect or slightly spreading, unequal: empty glumes lanceolate, acute, subequal, 1- $1\frac{1}{4}$ line long, 1-nerved, hispid on the keel: flowering glumes oblong, obtuse, thin, smooth except 2 tufts of short hairs at the base, 5-nerved, $\frac{3}{4}$ line long: palet wanting. In moist meadows, Washington to California.

A. Diegoensis Vasey. *A. foliosa* Vasey. Stems erect or decumbent at base, smooth, 1-2 feet high: sheaths close, equalling or exceeding the internodes: ligules obtuse, 1-2 lines long: leaves flat, 4-8 inches long, 2-3 lines wide: panicle loose, 3-6 inches long, its slender scabrous branches 1-2 inches long, spreading or ascending: empty glumes ovate, acute, 1-nerved, 1- $1\frac{1}{2}$ lines long, usually equal, the lower one scabrous on the keel: flowering glume ovate-oblong, nearly equalling the outer ones, smooth except a tuft of hairs at base, 4-nerved above, the nerves terminating in 4 short teeth; awn arising at the middle or below, $\frac{1}{2}$ -2 lines long: palet wanting. On open hillsides in the mountains, Brit. Columbia to Calif. ia.

A. geminata Trin. Unif. 207. Densely cespitose: stems slender, erect, 8-14 inches high, from a perennial root: leaves flat, mostly basal, 1-3 inches long: panicle loose, 2-4 inches long, its capillary branches mostly in pairs, spreading: empty glumes nearly equal $1\frac{1}{4}$ - $1\frac{1}{2}$ lines long, lanceolate, scabrous on the keel: flowering glume less than a line long, obtuse or retuse; awn arising about the middle, not surpassing the glume. Washington to Alaska.

A. attenuata Vasey Bot. Gaz. xi, 337. Stems slender 2-3 feet high, from running perennial roots-tocks, usually solitary: sheaths shorter than the internodes, smooth: ligules 2-3 lines long, lanceolate, often lacerate at the acutish apex: leaves few, 3-6 inches long, 1-2 lines wide: panicle 2-6 inches long, the unequal capillary branches in fascicles of 2-7, spreading or ascending: empty glumes equal, oblong-lanceolate, acuminate, about $1\frac{1}{2}$ lines long, scabrous on the keel: flowering glume oblong, obtuse, $\frac{3}{4}$ as long as the outer ones: palet wanting. In wet mountain meadows, Oregon to California.

A. Scouleri Trin. Agrost. ii, 93. Stems slender, erect, 1-2 feet high, from a perennial root, somewhat rigid: sheaths smooth, longer than the internodes ligules about 1 line long, obtuse, often lacerate: leaves 3-4 inches long, flat or involute, $1\frac{1}{2}$ lines wide, tapering to a long point: panicle long-exserted, open and few-flowered, the lower branches over an inch long, clustered: empty glumes about 1 line long, acute, the lower a little longer and roughened on the keel, the upper roughened only at the tip: flowering glume 5-nerved, entire and somewhat truncate at the apex: palet hyaline, very minute. Nootka Sound to California.

A. Howellii Scribn. Loosely tufted perennial: stems rather slender, 1-2 feet long: ligules about a line long, usually obtuse and lacerate at the apex: panicle 4-8 inches long, its scabrous capillary branches 2-3 inches long, usually spreading: empty glumes 1 line or less long, acuminate-lanceolate; flowering glume lanceolate, acute, bearing a long slender bent awn on its back: palea hyaline, minute. On cliffs along the Columbia river.

A. scabra Willd Sp Pl. i, 370. Stem very slender, 1-2 feet high, from a perennial root, smooth: sheaths generally shorter than the internodes: ligules 1-2 lines long: leaves 2-5 inches long, $\frac{1}{2}$ -1 $\frac{1}{2}$ lines wide, usually erect roughish: panicle 6-12 inches long, usually purplish, its capillary branches spreading or ascending, or often drooping, the lower 3-6 inches long: empty glumes $\frac{1}{2}$ -1 line long, acute, scabrous toward the apex and on the keel; flowering glume nearly as long as the outer ones, rarely bearing a short awn on its back: palea very small. Common throughout most parts of North America.

A. Idahoensis Nash Bull. Torr. Bot. Club xxiv, 42. Stems caespitose, slender, 8-16 inches high, erect, bearing usually 2 distant leaves below the middle: lower sheaths short, the upper one elongated: ligules 1-2 lines long, obtuse cut-toothed at the apex: leaves 2-5 inches long, erect, acuminate at the apex, rough on the margins: panicle oblong 3-6 inches long, its branches and pedicels scabrous above: empty glumes lanceolate and acuminate, about 1 line long, scabrous on the keel, the first longer than the second: flowering glume about $\frac{3}{4}$ as long as the outer ones: palea wanting. In forests, Idaho.

A. varians Trin. Agrost. ii, 68. Stems slender, erect, densely caespitose, 3-10 inches high: sheaths longer than the internodes: upper ligule about $\frac{1}{2}$ line long, acutish: leaves very narrow, slightly scabrous above: panicle 1-2 inches long, dark purple, its branches an inch or less long, erect or ascending: empty glumes nearly equal, roughish on the keel toward the apex, subacute; flowering glume nearly as long as the outer ones, 2-toothed at the apex, awnless: palea wanting. In wet places on the high mountains, Washington to California.

A. Oregonensis Vasey. Stems slender, erect, 1-2 feet high, from a perennial root: leaves flat, 2-3 inches long, the upper one usually longest: ligules 1-2 lines long, acute: panicle long-exserted, 2-4 inches long, dark purple, narrow, its capillary branches 1-2 inches long, erect: empty glumes lanceolate, acuminate, about 1 line long; flowering glume hyaline, about $\frac{1}{2}$ as long as the outer ones, acute, not awned: palea wanting. In moist meadows about the base of Mount Hood, Oregon.

A. humilis Vasey Bull. Torr. Bot. Club x, 21. Stems densely caespitose, 2-6 inches high, from perennial roots: sheath usually only one, about $\frac{1}{4}$ as long as the stem: ligules auriculate or 3-lobed, $\frac{1}{2}$ line long: leaves mostly basal, 1-3 inches long, less than a line wide, erect: panicle narrow, 6-18 lines long, dark purple, its very few branches erect or appressed: empty glumes equal, lanceolate, acute, smooth, $\frac{3}{4}$ -1 line long; flowering glume nearly equalling the outer ones, lanceolate, minutely toothed at the apex: palea ovate-oblong. In wet meadows on high mountains, Washington to the Rocky Mountains.

A. virescens HBK. Nov. Gen. i, 135. Stems 1-2 feet high, from a perennial root: sheaths much shorter than the internodes mostly smooth: ligules more than a line long, truncate: leaves flat, erect, about 6 inches long by 4 lines wide, rough on both sides: panicle pale greenish tinged with purple, about 6 inches long, its branches in clusters about an inch apart on the common axis: empty glumes very acute, the lower terminated by a distinct seta, rough on the keel and pubescent all over; flowering glume about $\frac{1}{2}$ shorter than the empty ones, bearded at base by a few short white hairs, 5-nerved, the lateral nerves projecting as distinct teeth,

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the central one excurrent at or below the middle as a strong bent awn 1-2 lines long: palet very small or none. Oregon to California.

13. GASTRIDIDIUM Beauv. Agrost. 21.

Panicle contracted into a somewhat loose tapering spike. Spikelets 1-flowered. Empty glumes with an enlarged ventricose shining base, very acute above, obscurely keeled, the lower longest. Flowering glume less than 1/4 as long as the empty ones, minutely hairy at base, very thin, truncate and dentate at the apex. Awn slender, arising just below the apex, equalling or exceeding the glumes. Palet equalling the flowering glume. Scales 2, linear, as long as the ovary. Stamens 3. Stigmas 2, subsessile.

G. AUSTRALE Beauv. l. c. Loosely cespitose: stems 6-24 inches high, smooth, branching at the lower nodes, geniculate below: sheaths shorter than the internodes, slightly roughened: ligules 2 lines long, lanceolate, fringed: leaves flat, 2-5 inches long about 2 lines wide, scabrous on both sides, pale green: panicle 3-6 inches long, very pale green, shining with a satiny lustre; empty glumes about 2 lines long, very acute, slightly scabrous above, shining below: flowering glume hairy. On prairies, southern Oregon to California: introduced from Europe.

14. CINNA L. Sp. 5.

Tall grasses with flat leaves and numerous spikelets in more or less open panicles. Panicles flexuous, with spreading or erect branches. Spikelets one-flowered, more or less flattened. Empty glumes lanceolate, acute, one-nerved, the lower shortest, the upper equalling or slightly exceeding the flower. Flowering glume 3-nerved, acute and awnless, or bearing a short awn or seta just below the apex. Palet slightly shorter than the glume. Scales 2, very short. Stamens 1, 2 or 3. Ovary oblong, smooth. Styles 2, elongated. Stigmas plumose. Grain free, linear-oblong.

C. pendula Trin. Mem. Acad. St. Petersb. vi, 280. Stems usually slender, erect, 2-6 feet high, smooth: sheaths shorter than the internodes, sometimes slightly scabrous: ligules 1-2 lines long: leaves 4-10 inches long, 2-6 lines wide, scabrous: panicle 5-10 inches long, open, the capillary branches mostly spreading, flexuous and often drooping, the lower 2-5 inches long: empty glumes 1 1/2 lines long, scabrous, acute, strongly hispid on the keel: flowering glumes shorter than the outer ones, bearing a rough awn 1 1/2 lines long from the 2-toothed apex. In wet places, California to Alaska and the Eastern States.

15. MUHLENBERGIA Schreb. Gen. 44.

Mostly perennial grasses with flat or convolute leaves and paniculate inflorescence. Panicle contracted or open. Spikelets one-flowered, very rarely two-flowered. Empty glumes hyaline or membranous, acute, sometimes awned. Flowering glume 3-5-nerved, obtuse or acute, or often produced into a capillary awn. Palet 2-keeled. Stamens 2 or 3. Styles distinct, with plumose stigmas. Grain narrow, tightly enclosed in the glume.

M. glomerata Trin. Unif. 191. Stems 1-2 feet high, erect, usually much branched, smooth: sheaths smooth, those of the stem shorter than the internodes, those of the branches overlapping and often crowded:

ligules about one half line long, erose-truncate: leaves 2-5 inches long, 1-3 lines wide, scabrous: panicle 1-5 inches long, usually dense and interrupted, the branches 6-12 lines long, erect or appressed: empty glumes acuminate, including the awn 2-3 lines long: flowering glumes $\frac{1}{2}$ as long as the outer ones, acuminate the strongly scabrous midrib excurrent as a short point. In wet places, eastern Washington to Brit. Columbia and the Eastern States.

M. sylvatica Torr. Fl. U. S. 87. Stems 1-3 feet high, erect, branched, smooth or sometimes scabrous: sheaths smooth or slightly scabrous, those of the stem shorter than the internodes: ligules about one-half line long, erose-truncate: leaves 2-7 inches long, 1-3 lines wide, rough: panicle 3-7 inches long, somewhat lax, the branches 1-3 inches long, erect or ascending: empty glumes $1\frac{1}{4}$ - $1\frac{1}{2}$ line long, awn-pointed, scabrous: flowering glume equalling or exceeding the outer ones, strongly scabrous, attenuate into a slender awn 2-4 times as long as the body. In moist woods and along streams Idaho to the Eastern States.

Var. setigumis Watson Bot. King 378. Stems 1 foot high, nearly erect: panicle contracted, the branches solitary and densely flowered: empty glumes attenuate into a scabrous bristle, 2-3 lines long; the flowering glume with its long awn about twice longer. In the mountains, eastern Washington to Nevada.

M. comata Benth. Vasey Cat. Grasses U. S. 39. Stems slender, erect, 12-18 inches high, smooth: sheaths shorter than the internodes: smooth or slightly scabrous: ligules about one-half line long, truncate, naked or minutely ciliate: leaves 2-5 inches long, 1-2 lines wide, erect, flat, rough: panicle 2-4 inches long, dense, its branches 6-18 lines long, erect: empty glumes equal or the upper one a little the longest, smooth, scabrous on the keel: flowering glume shorter than the outer ones, smooth, bearing an awn 2-3 times its length. basal hairs silky, erect, fully as long as the glumes. On prairies, eastern Oregon to California and Colorado.

16 CALAMAGROSTIS Adans. Fam. Pl. ii, 31.

Mostly perennial grasses with flat leaves and paniculate inflorescence. Spikelets one-flowered, the rachella usually prolonged beyond the flower and pubescent. Empty glumes membranous, carinate: flowering glume hyaline, shorter than the empty ones, obtuse, usually copiously hairy at base, sometimes the hairs scanty or short, and bearing a dorsal awn. Palet shorter than the glume, two-nerved. Stamens 3. Styles short, distinct, with plumose stigmas. Grain free, enclosed in the glume.

C. Howellii Vasey Bot. Gaz. vi, 271. Densely tufted perennial: stems 10-20 inches high, erect or somewhat geniculate below, smooth: sheaths smooth, shorter than the internodes: ligules 1 line or more long, often lacerate at the obtuse or acutish apex: radical leaves numerous, loosely involute, erect, nearly equalling or exceeding the stems, persistent and green for several years: panicle 3-4 inches long, its branches spreading in flower, soon erect, the lower 6-18 lines long: empty glumes 2-3 lines long, nearly equal, lanceolate, acute, strongly keeled, the mid-rib prolonged into a short awn: flowering glume slightly shorter than the outer ones ovate-lanceolate, acute, the apex with 2 mucronate pointed teeth, the strong awn inserted about the lower third, half an inch long: pale shorter than its glume: basal hairs about half as long as the flower. On cliffs along the Columbia river near the Cascades.

C. purpurascens R. Br. Richards. App. Frankl Journ. 131. Rather rigid caespitose perennial: stems erect, simple, smooth and shining, or

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C. *Vaseyi* Beal Grasses N. Am. ii, 344. Stems densely caespitose, 2-3 feet high, erect: sheaths shorter than the internodes: ligules about 1 line long, ciliate at the obtuse apex: leaves flat, rather rigid, 4-10 inches long, 1-2 lines wide: panicle 3-4 inches long, narrow and spike-like, often interrupted: empty glumes about 2 lines long, lanceolate, very acute or acuminate, rough on the keel: flowering glume 1½ lines long, 2-toothed at the apex: awn nearly straight, 1-2 lines long, attached below the middle: basal hairs short and rather scanty; palet linear-oblong, as long as the glume. In the mountains of Oregon and Washington.

C. *Tweedyi* Scribn. Vasey Mon. Grasses U. S. 83. A closely tufted stoloniferous perennial: stems erect, smooth, stout, 30-40 inches high: sheaths rather loose, smooth or slightly scabrous, shorter than the internodes: ligules thin, 2-4 lines long: leaves flat, hispid, 1-10 inches long, 3-5 lines wide: panicle close and spike-like, 3-4 inches long, the branches an inch long or less, appressed, unequal: empty glumes lanceolate, acute, nearly smooth, about 3 lines long, the first 1-nerved, slightly carinate, the second 3-nerved, convex: flowering glume ovate-oblong unequally toothed at the rounded apex 4-nerved 2½ lines long: awn attached ¼ way from the base, twisted and bent, 3-4 lines long: basal hairs short and unequal: palet lance-oblong, obtuse, smooth. In the Cascade Mountains of Wash.

C. *Aleutica* Bong. Veg. Sitcha 171. A densely caespitose perennial: stems erect, smooth, 2-5 feet high: sheaths loose, slightly roughened, usually shorter than the internodes: ligules ovate, nearly 2 lines long: leaves flat, or loosely involute, with long attenuate points, hispid on both sides, 10-20 inches long: panicle rather narrow, 6-20 inches long, its branches unequal, crowded in 10-15 clusters, the longer ones 1-3 inches long: empty glumes narrowly lanceolate, acute, hispid on the nerves, the first one carinate, 1-nerved, 2½-3 lines long, the second convex, 3-nerved, ¼ line shorter: flowering glume oblong, obtusely 2-lobed at the apex, thin, hispidulous, 2 lines long: basal hairs half as long as the glume: awn attached below the middle, not equalling the glume: palet oblong, irregularly toothed or fringed at the obtuse apex. In wet places near the coast, California to Alaska.

C. *rubescens* Buckl. Proc. Phila. Acad. 1863, 92. More or less purplish throughout: stems tufted, slender, erect, 30-40 inches high, from stout perennial rootstocks: sheaths half as long as the internodes: ligules 1½-2 lines long, lacerate at the acute apex: leaves of sterile shoots numerous, involute, setaceous, glaucous, scabrous, 5-10 inches long, 1½-2 lines wide, those of the stem 3-4, 2-7 inches long, usually with some woolly hairs at the base of the blade: panicle strict, dense, interrupted, 3-5 inches long, its short branches densely flowered to the base: empty glumes ovate-lanceolate, rough, acute, the first 1-nerved, the second 3-nerved: flowering glumes a little shorter, narrowly elliptical, acute, 2-toothed at the apex, the stiff twisted and bent awn arising a little below the middle and equalling the glume: basal hairs in 2 tufts, less than half as long as the glume. Oregon to California.

C. Saksdorffii Scribn. Vasey Monog. Grasses U. S. 82. A loosely tufted perennial: stems rather slender, 1-3 feet high, erect smooth: sheaths shorter than the internodes: ligules about 1 line long, obtuse, often lacerate: leaves usually involute, 6-12 inches long, about 1 line wide: panicle narrow, 2-3 inches long, densely flowered, its branches ascending or appressed: empty glumes oblong, acute, keeled, $1\frac{1}{2}$ line long: flowering glume lanceolate, about 1 line long, 2-toothed at the apex: awn nearly straight, attached below the middle, but little longer than the glume: basal hairs very few or none: palea lanceolate, nearly as long as the glume. Open woods, eastern side of the Cascade Mountains.

Var. luxurians Kearney U. S. Dept. Agr. Div. Agrost. Bull. 11, 24. Stems stout, 4-5 feet high, usually of softer texture: leaves softer and less involute: panicle larger and more loose. Washington to Brit. Columbia and Idaho.

C. Langsdorffii Trin. Unif. 225. Densely caespitose perennial: stems erect, simple, 2-4 feet high, smooth or roughish: sheaths shorter than the internodes: ligules 1-3 lines long: leaves 4-12 inches long, 3-4 lines wide, scabrous: panicle 2-6 inches long, loose, its branches spreading, or sometimes erect, the lower 1-3 inches long: empty glumes 2-3 lines long, strongly scabrous, lanceolate, acuminate: flowering glume lanceolate, acute nearly equalling the outer ones, scabrous: awn stout, about equalling the glume: basal hairs numerous, nearly equalling the glume: palea lanceolate. In damp places, California to Alaska and across the continent.

C. lactea Beal Grasses N. Am. ii, 346. Stems stout, scabrous, 40-50 inches high: sheaths $\frac{1}{2}$ - $\frac{3}{4}$ as long as the internodes: ligules 1-1 $\frac{1}{2}$ lines long: leaves 10-15 inches long, 2-3 lines wide, scabrous: panicle slightly exserted, silvery green, rather thin, 4-6 inches long, its branches in half-whorls of 4-6, the longest $1\frac{1}{2}$ -2 $\frac{1}{2}$ inches long: empty glumes subequal, 2-3 lines long, lanceolate, the first 1-nerved, the second 3-nerved: flowering glume oval, acute, 2 lines long, the slender awn attached near the base and equalling the glume: basal hairs numerous, about half as long as the glume. Northern Washington.

C. Canadensis Beauv. Agrost. 157. A densely caespitose perennial: stems 2-5 feet high erect simple, smooth or somewhat scabrous, sheaths shorter than the internodes: ligules 1-3 lines long: leaves 6-12 inches long or more, 1-4 lines wide, rough: panicle 4-7 inches long, open, usually purplish, the branches spreading or ascending, the lower 1-3 inches long, naked at the base: empty glumes subequal acute strongly scabrous, $1\frac{1}{2}$ -2 lines long: flowering glume lanceolate, about equalling the empty ones, scabrous: awn delicate, about equalling the glume: basal hairs numerous, about equalling or shorter than the glume. Common in wet meadows, California to Alaska and across the continent.

Var. acuminata Vasey U. S. Dept. Agr. Div. Agrost. Bull. 5, 26. Panicle commonly rather small, more flexuous, and densely flowered, usually dark purple: empty glumes narrower, sharp attenuate-acuminate, usually much more scabrous: awn longer, often exceeding the flowering glume. In meadows, California to Alaska and the Rocky Mountains.

C. Macouniana Vasey Contrib. U. S. Nat. Herb. iii, 81. Stems 2-3 feet high, erect, smooth: sheaths shorter than the internodes: ligules about 1 line long: leaves 3-7 inches long, 1-2 $\frac{1}{2}$ lines wide, erect, acuminate, scabrous: panicle open, 3-5 inches long, its branches ascending or sometimes erect, the lower 1-1 $\frac{1}{2}$ inches long: empty glumes about 1 line long, acute, scabrous, the first shorter than the second: awn a little exceeding the glume: basal hairs about equalling the glume. Washington to Brit. Columbia and Manitoba.

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C. *cusickii* Vasey Contrib. U. S. Nat. Herb, iii, 81. Loosely tufted perennial with numerous sterile shoots and few erect flowering stems 3-4 feet high: sheaths nearly smooth, of the stem half as long as the internodes, or the lower ones equalling the internodes, of the shoots close and overlapping: ligules obtuse, 2-3 lines long: leaves flat, 6-15 inches long, 2-4 lines wide, hispid on both sides: panicle 6 inches long, narrow and densely flowered, its unequal branches erect or ascending, the lower ones 1-2 inches long: empty glumes lanceolate, acute or acuminate, convex, nearly smooth, rigid, the first 1-nerved, 2-2½ lines long, the second obscurely 3-nerved and slightly shorter: flowering glume 4-toothed at the slightly cleft apex 1½ lines long: awn attached below the middle, exceeding the glume: basal hairs scanty, about half as long as the glume. In the mountains of eastern Oregon to California.

C. *neglecta* Gaertn, Fl. Wett. i, 91. Glabrous and smooth throughout: stems slender, 18-30 inches high: sheaths shorter than the internodes: ligules ½ line long or less, truncate: leaves narrow, involute, the basal ½ as long as the stems, those of the stems 2-5 inches long, erect: panicle contracted, 2-4 inches long, its branches 1 inch long or less, erect: empty glumes about 2 lines long, acute, scabrous: flowering glume about ¾ as long as the outer ones, obtuse: awn bent, exceeding the glume: basal hairs numerous, about half as long as the glume. In wet places, Oregon and Washington to Labrador and Newfoundland.

C. *inexpansa* Gray Gram. et. Cyp. i, 20. Stems 1½-3 feet high, erect: leaves 2 lines wide or less, rough, flat, or involute at the apex, the basal often ⅓-¾ as long as the stems: panicle contracted, 2-9 inches long, its branches 1-2 inches long, erect: empty glumes 1½-2 lines long, acute, somewhat scabrous: flowering glume obtuse, shorter than the outer ones: awn more or less bent, from a little shorter to longer than the glume: basal hairs equalling or shorter than the glume. Brit. Columbia to New York, to be looked for in Idaho.

Var. *cuprea* Kearney U. S. Dept. Agr. Div. Agrost. Bull. 11, 37. Somewhat stouter and more rigid: panicle more densely flowered: empty glumes copper-color or dark purple with copper-colored tips. In shallow water, base of Mount Adams, Washington.

Var. *barbulata* Kearney l. c. Stems stout, pubescent just below the strongly constricted nodes with short reflexed hairs, somewhat scabrous for some distance below the pubescence: sheaths strongly twisted: panicle rather rigid, purplish: awn very short, attached above the middle, not equalling the glume, often wanting. Mason Co. Washington.

C. *hyperborea* Lange Fl. Dan. 50. Stems 1½-3 feet high, erect, smooth: sheaths shorter than the internodes: ligules about 1 line long: leaves 2 lines wide or less, rough, flat, those of the stem 2-10 inches long: panicle narrow, 2-9 inches long, its branches 1-2 inches long, erect: empty glumes about 2 lines long somewhat scabrous, acute: flowering glume nearly equalling the outer ones, obtuse: awn more or less bent, from a

little shorter to slightly longer than the glume: basal hairs equalling or shorter than the glume. In bogs, Washington to California and the Eastern States.

Var. *angata* Kearney l. c. 40. Less strongly caespitose and less rigid, with few sterile shoots; smaller spikelets and often less pointed empty glumes. California to Brit. Columbia and Ontario.

Var. *Americana* Kearney l. c. 41. Panicle usually very dense: empty glumes $1\frac{1}{2}$ -2 lines long, usually very acute. Oregon to Brit. Columbia and Hudson Bay.

C. *crassiglumis* Thurber Bot. Cal. ii, 281. Stems about 1 foot high, erect, rigid: sheaths loose, smooth, longer than the internodes: ligules obtuse, $\frac{1}{2}$ line long or less: leaves 2-6 inches long, spreading, involute toward the acute tips: panicle dense and spike-like, 2 inches long, deep purple, its branches glomerate, 2-6 lines long, appressed: empty glumes broadly lanceolate or lance-ovate, abruptly pointed, subcartilaginous with thin margins, hispidulous throughout, hispid on the nerves, 3 lines long or less: flowering glume oblong-ovate, toothed at the obtuse apex, minutely hispid, $1\frac{1}{2}$ lines long: awn attached at the middle or below, equalling or exceeding the glume: basal hairs numerous $\frac{3}{4}$ as long as the glume: palea oblong, about 1 line long, broadest at the apex. In swamps, northern California to Brit. Columbia.

CALAMOVILFA Hack. True Grasses, 113. (1890.)

Tall grasses with stout horizontal rootstocks, elongated leaves and numerous spikelets in more or less open panicles. Spikelets one-flowered, the rachella not prolonged beyond the flower. Glumes 3, one-nerved, acute, the two outer unequal empty: the third longer or shorter than the second, with a ring of hairs at base. Palea strongly 2-keeled. Stamens 3. Styles distinct, with plumose stigmas. Grain free. Seed adherent to the pericarp.

C. *logifolia* Hack. l. c. Stems stout, 5-6 feet high: sheaths longer than the internodes, smooth or more or less soft woolly: leaves very long and narrow, with involute attenuate points: panicle 5-20 inches long, at first rather narrow and close, but later spreading, its branches rather distant: spikelets compressed, 3-4 lines long: first glume cuneate, 2-3 lines long, second lance-linear and longer: flowering glumes as long as the second one, cuneate-lanceolate: basal hairs two-thirds as long as the glume. In sandy places, Brit. Columbia to eastern Oregon and Colorado.

Tribe 4 Chloridæ. Spikelets one- to several-flowered, in one-sided digitate or fasciculate, rarely solitary, spikes or racemes. Flowering glumes usually keeled, entire and unawned, or toothed and with one or three straight awns.

17 SPARTINA Schreb. Gen. 43.

Glabrous perennial grasses with horizontal rootstocks, flat or involute leaves and one-sided spikes in panicles. Spikelets narrow, borne in 2 rows on one side of a triangular rachis, articulated with the very short pedicels below the glumes. Glumes 3, the 2 outer empty, keeled, very unequal, the third subtending a perfect flower, keeled, equalling or shorter than the second. Palea often longer than the glumes two-nerved. Stamens 3. Styles filiform, elongated, with filiform papillose or shortly plumose stigmas. Grain free, laterally compressed.

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S. cynosuroides Willd. Enum. 80. Stems 2-6 feet high, simple, smooth: sheaths longer than the internodes, those at the base of the stem crowded: ligules a ring of hairs: leaves a foot long or more, 3-7 lines wide, scabrous on the margins, becoming involute in drying, attenuate into long slender tips: spikes 5-30, 2-5 inches long, often on peduncles 6-12 lines long, erect or ascending: rachis rough on the margins: spikelets much imbricated, 6-7 lines long: empty glumes 2-4 lines long, awn-pointed or awned, strongly hispid-scabrous on the keel: flowering glume as long as the first, the scabrous midrib terminating just below the emarginate or 2-toothed apex: palet sometimes exceeding the glume. Along streams, eastern Oregon to Nova Scotia and Texas.

S. gracilis Trin. Mem. Acad. St. Petersburg. vi, 110. Stems 1-3 feet high, erect, smooth: sheaths longer than the internodes, the lower ones crowded: ligules a ring of short hairs: leaves 6-12 inches long, 1-3 lines wide, flat or involute, attenuate into long tips: spikes 4-8, 1-2 inches long, appressed, more or less peduncled: empty glumes 3-4 lines long, acute scabrous-hispid on the keel, the first half as long as the second: flowering glume obtuse, slightly shorter than the second one: palet obtuse, about equalling the glume. In wet meadows, eastern Oregon to Brit. Columbia and Nebraska.

18 BECKMANNIA Host. Gram. Austr. iii, 5.

Tall erect grasses with flat leaves and erect spikes in a terminal panicle. Spikelets one- or two-flowered, compressed-globose. Glumes 3 or 4, the two lower empty membranous, saccate, obtuse or abruptly acute: flowering glumes narrow, thin-membranous. Palets hyaline, two-keeled. Stamens 3. Styles distinct, with plumose stigmas. Grain free, enclosed in the glume and palet.

B. cruciformis Host l. c. Glabrous throughout: stems often stout, 2-3 feet high, erect: sheaths longer than the internodes, loose: ligules 2-4 lines long, obtuse, often lacerate: leaves 3-10 inches long, 2-4 lines wide, rough: panicle 4-10 inches long, simple or compound, the spikes about 6 lines long: spikelets 1-2 lines long, 1-2-flowered, closely imbricated in 2 rows on one side of a flattish rachis: glumes smooth, the first two saccate and empty, obtuse or abruptly acute: flowering glumes acute, the lower usually awn-pointed. Common in ditches and along streams, California to Brit. Columbia and Iowa.

19 BOUTELLOUA Lag. Var. Cienc. y Litter Part 4, 134.

Annual or perennial grasses with flat or convolute leaves and numerous spikelets in one-sided spikes. Spikelets one- or two-flowered, arranged in two rows on one side of a flat rachis, the rachella extended beyond the base of the flowers, bearing 1-3 awns and 1-3 rudimentary glumes. Two lower glumes empty, acute, keeled: flowering glumes broader, 3-toothed, the teeth awn-pointed or awned. Palets hyaline, entire or toothed. Stamens 3. Styles distinct, with plumose stigmas. Grain free, oblong.

B. oligostachya Torr, Gray Man. ed 2, 553. Stems 6-13 inches high, glabrous: sheaths shorter than the internodes: ligules a ring of short hairs: leaves 1-4 inches long, 1 line wide or less, involute, at least at the long slender tips, smooth or scabrous: spikes 1-3, 1-2 inches long, often strongly curved, the rachis terminating in a short inconspicuous point: spikelets numerous, pectinately arranged, about 3 lines long, first glume hyaline, shorter than the membranous second one which is scabrous and sometimes long-ciliate on the keel: flowering glume pubescent, 3-cleft, the nerves terminating in awns: rachella with a tuft of long hairs under the rudimentary glumes and awns. On

prairies, Washington to California and Wisconsin.

20 ELEUSINE Gært. Fruct. et Sem. i, 7.

Tufted annual or perennial grasses with flat leaves and spicate inflorescence, the spikes digitate or close together at the summit of the stem. Spikelets several-flowered, sessile, closely imbricated in two rows on one side of the rachis, which is not extended beyond them. Flowers all perfect, or the upper staminate. Glumes compressed, keeled, the two lower empty, the others subtending flowers or the upper empty. Stamens 3. Styles distinct, with plumose stigmas. Grain loosely enclosed in the glume.

E. INDICA Gært. l. c. Stems 6-12 inches long, tufted, erect or decumbent, glabrous: sheaths loose, longer than the internodes, often crowded at the base of the stem, glabrous sometimes sparingly villous: ligules very short: leaves 3-12 inches long, 1-3 lines wide, smooth or scabrous: spikes 2-10, 1-3 inches long, whorled or approximate at the summit of the stems or one or two sometimes distant: spikelets 3-8 flowered, $1\frac{1}{2}$ -2 lines long: glumes acute minutely scabrous on the keel, the first 1-nerved, the second 3-7-nerved, the others 3-5-nerved. In fields and waste places, naturalized from Europe.

Tribe 3 Stipacæ. Spikelets strictly 1-flowered. Flowers with a sharp pointed callus, deciduous. Flowering glume enfolding the palet and grain, coriaceous and indurated in fruit, and terminated by a simple or triple awn.

21 STIPA L. Sp. 78.

Mostly tall grasses with usually convolute leaves and paniculate inflorescence. Panicle open, with a few spreading branches, or sometimes crowded and narrower spikelets 1-flowered, the cylindrical flower with an obconic bearded and often elongated sharp-pointed base. Glumes subequal, membranous, often terminated by a long subulate point. Flowering glume coriaceous, cylindrical-involute, enclosing the mostly shorter palet, entire at the apex or terminating in 2 minute sometimes hyaline teeth, naked or with a crown of short hairs, conspicuously awned. Awn articulated with the glume, often caducous, geniculate below, glabrous or pubescent, or plumose with spreading hairs. Stamens usually 3. Styles short, distinct: stigmas plumose with simple hairs. Grain cylindrical, smooth, free, enclosed in the glume.

S. occidentalis Thurber Bot. Wilkes 483. Stems slender 1-2 feet high, somewhat scabrous, pubescent at the nodes: sheaths close, hispid. shorter than the internodes: ligules 2-2½ lines long, lacerate at the apex: leaves filiform, convolute, sharp pointed, hispid, 2-12 inches long: panicle slender, 3-4 inches long, often included at the base, its branches mostly in twos, erect, 1-2 inches long: spikelets lanceolate, turgid, 4-6 lines long: empty glumes appressed, lanceolate, acute, thin, purplish below, smooth, the first one obscurely 5-7-nerved at base, 5-6 lines long, the second about 1 line shorter, 3-nerved: stipe obconical, acute, pubescent, $\frac{1}{2}$ line long: flowering glumes thin-chartaceous, pubescent, plainly 5-nerved: awn articulated, persistent, flattened, twisted, $1\frac{1}{2}$ -2 inches long, bent near the middle, the lower half plumose: palet oblong, 2-2½ lines long, pubescent on the back and obtuse apex. Common in the mountains, central California

to Washington.

S. comata Trin. & Rupr. Mem. Acad. St. Petersburg. (vi.) v, 75. Stems stout, 1-4 feet high, mostly scabrous: sheaths loose, the uppermost sometimes inflated, smooth, at length shorter than the internodes: ligules conspicuous, acute, 2-3 lines long: leaves smooth or somewhat scabrous, the basal ones $\frac{1}{4}$ - $\frac{1}{2}$ as long as the stems, those of the stems 3-6 inches long, involute: panicle 6-9 inches long, loose, its branches 3-5 inches long, ascending: empty glumes 9-12 lines long, glabrous, acuminate into an awn 2-4 lines long: flowering glume 4-6 lines long; callus acute: awn slender, 4-8 inches long, spiral and pubescent below: palea equalling the glume. On prairies, eastern Oregon to Brit. Columbia, Alberta, Nebraska and Cal.

S. setigera Presl Reliq. Hænk. i. 226. Stems stout, $1\frac{1}{2}$ -3 feet high, often pubescent at the nodes: sheaths hairy at the throat, the lower shorter than the internodes: ligules truncate, about 1 line long: leaves of sterile shoots mostly involute, $\frac{1}{2}$ as long as the stem, those of the stem 2-3, often flat 6-18 inches long, 3-5 lines wide: panicle usually included at base in the upper sheath, 6-15 inches long, its slender branches mostly in pairs: empty glumes subequal, or the upper shorter, long-acuminate, 3-nerved, 8-12 lines long: flowering glume 6 lines long, silky-hairy on the nerves, the callus sharp and curved: awn 3-5 inches long, twisted and pubescent below, geniculate and above the middle bent again. On dry hills, eastern Oregon to California, Texas and Kansas.

S. Kingii Bolander Proc. Cal. Acad. iv, 170. Stems erect, smooth, 5-12 inches high, naked above, with but 2 nodes near the base which are covered with the remains of many sheaths: radical leaves half as long as or equalling the stem, setaceous convolute, minutely scabrous, stem leaves 2, the upper with close sheaths 3-6 inches long: ligule a line long, acute, often cleft: panicle narrow 1-2 inches long, the short erect branches scabrous empty glumes obtuse, eroded and sometimes mucronate hyaline with a tinge of purple at base: the first one $1\frac{1}{2}$ lines long: stipe obconical scarcely acute short-bearded: flowering glume ovate, brownish-purple, pubescent: awn persistent, finely pubescent, loosely twisted and somewhat bent below the middle: palea broadly ovate, obtuse. Eastern Oregon to Nevada and California.

S. Bloomeri Bolander l. c. 168. Stems $1\frac{1}{2}$ -3 feet high, clothed at base with the remains of old sheaths: sheaths shorter than the internodes, the upper somewhat inflated: leaves very narrow and convolute, smooth or somewhat roughened, the lower ones about half as long as the stems: panicle 6-12 inches long, erect, narrow, with distant branches: empty glumes 4 lines long, nearly equal, acuminate into a slender point, 3-nerved, minutely scabrous: flowering glume $2\frac{1}{2}$ lines long, minutely 2-toothed at the apex: awn 6-9 lines long, geniculate near the middle, almost plumose below, scabrous above: palea nearly as long as the glume. Eastern Oregon to Nevada and California.

S. Oregonensis Scribn. U. S. Dept. Agr. Div. Agrost. Bull. 17, 130. Stems erect, slender 12-18 inches high; pubescent at the nodes: sheaths rather loose, minutely hispid, longer than the internodes; ligules lacerate, the lateral teeth longer: radical leaves 10-15 inches long, involute; those of the stem 3-6 inches long, conduplicate or involute, 1-2 lines wide: panicle narrow, included in the upper sheaths, the branches appressed, unequal, 1 inch long or less: empty glumes lanceolate, slender-pointed, convex and herbaceous below, thin-membranous and carinate above, sometimes purplish: first glume 5-6 lines long, second usually $\frac{1}{2}$ line shorter: stipe slender, curved, acute, short-bearded: flowering glume thin-chartaceous, with 2 ciliate teeth, pubescent, 5-nerved: awn twisted and pubescent below, naked above, usually bent twice, 1-2 inches long: palea lanceolate, cleft or cross dentate at the apex, pubescent between the 2 nerves, $1\frac{1}{4}$ lines long.

In the mountains, Washington to California.

S. viridula Trin. Bull. Sc. Acad. St. Peterab. i, 67. Stems $1\frac{1}{2}$ -5 feet high, with numerous withered sheaths at base: sheaths half as long as the internodes or less: ligules very short: leaves all involute-setaceous at the apex, smooth or slightly scabrous, pale green, the lower $\frac{1}{2}$ as long as the stem: panicle 6-18 inches long, narrow, loose, the short erect branches in twos or threes: spikelets 4-5 lines long, on short pedicels: empty glumes nearly equal, ovate, bristle-pointed, the lower 5-nerved, the upper 3-nerved: flowering glume about $\frac{1}{2}$ shorter than the empty ones, with short scattered hairs which form an irregular crown, and with 2 very minute hyaline teeth, the callus very short: awn $1-1\frac{1}{2}$ inches long, slender, flexuous, usually twice bent, pubescent below, scabrous above at length deciduous: palea more than half as long as the glume. California to Brit. Columbia and Nebraska.

S. minor Scribn. l. c. 11, 46. Densely caespitose: stems 16-24 inches high, smooth or very minutely pubescent below the nodes: sheaths smooth: ligules very short, slightly auricled, broader than the base of the leaves: leaves 5-15 inches long, 1-2 lines wide, with very long attenuate-involute tips: empty glumes lanceolate, sharply acuminate-pointed, 3-nerved near the base, the lower slightly broader and longer than the upper and less distinctly nerved: flowering glume, including the short callus, 2 lines long, thinly pilose all over and with a crown of hairs at the distinctly 2-toothed apex: awn once or twice bent, about 10 lines long, very minutely scabrous: palea about $\frac{1}{4}$ as long as the glume. Moist mountain sides, Idaho to Montana and Colorado.

S. Lemmonii Scribn. U. S. Dept. Agr. Div. Agrost. Circ. 30, 3. Stems slender, rigid, erect, 1-2 feet high, glabrous: sheaths glabrous, shorter than the internodes: ligules less than a line long, rounded, entire, leaves 2-8 inches long, 1-2 lines wide, glabrous beneath, pubescent and strongly striate above, closely involute when dry: panicle 5-8 inches long, strict, its branches erect, $1-1\frac{1}{2}$ inches long, few-flowered: empty glumes nearly equal, about 6 lines long, broadly lanceolate, long acuminate-pointed, 3-5-nerved, scarious except the nerves: flowering glume oblong, about 6 lines long, obtuse, 2-toothed at the apex, thinly pilose all over with appressed hairs: palea hairy, nearly as long as the glume. Dry rocky slopes, eastern Washington to California.

22 ORYZOPSIS Michx. Fl. i. 51.

Usually tufted grasses with flat or convolute leaves and paniced inflorescence. Spikelets broad, one flowered. Glumes 3, the 2 lower ones about equal, obtuse or acuminate, the third shorter or a little longer, broad, bearing a terminal awn which is early deciduous. Callus short and obtuse or a mere scar. Stamens 3: styles distinct. Stigmas plumose. Grain oblong, free, tightly enclosed in the glume.

O. cuspidata Vasey Special Rep. U. S. Dept. Agr. 63, 23. Closely tufted perennial: stems slender thickened at base, solid smooth 12-18 inches long: sheaths shorter than the internodes, smooth and close, the upper one longer and loose: ligules ovate, a line long, acute or lacerate: radical leaves numerous, the scarious sheaths clustered thick about the base of the stems, 6-10 inches long, involute: panicle very loose, 4-6 inches long, inclosed at the base, branches mostly in pairs, distant, horizontal, divided in pairs beyond the middle, bearing solitary spikelets on long flexuous pedicels: spikelets 3 lines long, first and second glumes equal, inflated and widened below, narrower above to a long sharp point, scarious except the 5 nerves, minutely pubescent: flowering glume ovoid, or oblong, profusely

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clothed with long white hairs 1½ lines long, terminating in an awn 2 lines long which falls at maturity: palet conical, smooth, hard, brown. On sandy plains. Eastern Oregon to California, Texas and Brit. Columbia.

O. exigua Thurber Bot. Wilkes 481. Stems slender, erect, 6-15 inches high, hispid, the nodes black, scarcely constricted: leaves of sterile shoots numerous with close striate hispid sheaths and narrow involute wiry scabrous blades 4-7 inches long, of the stem usually 4, lower 2 with short overlapping sheaths and blades like the radical ones, next sheath above much shorter than the internodes with blades 2-4 inches long: ligules acute, 1-2 lines long: panicle narrow, secund, 2-3 inches long, its branches usually in pairs, erect: unequal: empty glumes oblong-ovate, barely acute, or abruptly acuminate, membranous, minutely scabrous, equal, 2-2½ lines long flowering glumes herbaceous, becoming chartaceous, obtuse or with purple teeth at the apex, short-pubescent throughout, 5 nerved, the nerves united above: awn persistent, minutely hispid, 2-3 lines long: palet equalling the glume, obtuse or bidentate at the apex. In the mountains of Oregon and Washington.

O. Hendersoni Vasey Contrib. U. S. Nat. Herb. 7, 267. Stems densely tufted, 7-10 inches high: lower sheaths rather loose: leaves scabrous, conduplicate, rigid pungent 4-5 inches long: panicle narrow 2½-4 inches long, its branches mostly in twos, the longest 1½-2½ inches long bearing 2-4 spikelets near the ends: empty glumes broadly oblong, obtuse and toothed, the first 3-nerved, the second 5-nerved: flowering glume linear, oblong, 2 lines long, smooth, coriaceous, obscurely 5-nerved, bearing 2 lateral teeth: awn curved, caducous, 5-6 lines long. Washington.

23 ARISTIDA L. Sp. 82.

Annual or perennial grasses with narrow leaves and various inflorescence. Spikelets narrow, one-flowered. Glumes 3, narrow, the 2 outer empty, carinate, the third rigid and convolute, bearing 3 awns, sometimes united at base, the lateral ones rarely wanting or reduced to rudiments. Palet 2-nerved. Stamens 3. Styles distinct. Stigmas plumose. Grain free, tightly enclosed in the glume.

A. purpurea Nutt. Trans. Am. Phil. Soc. (II) v, 145. Stems slender, tufted, erect, nearly smooth, 1-2 feet high: lower leaves with narrow close sheaths and slender involute blades 4-10 inches long: lower sheaths longer than the internodes, the upper ones much shorter: ligules a line of fine short hairs: panicle rather loose, narrow, 4-6 inches long, its branches 2-3 at each node, unequal the lower 1-2 inches long, naked below: spikelets 5-6 lines long, first glume narrowly lanceolate-linear, emarginate, mucronate, hispid on the keel, 1-nerved, 4-5 lines long; the second similar but nearly 2 lines longer, stipe hairy: flowering glume linear-lanceolate, recurved, slightly hispid on the nerves above, 4 lines long, terminating in 3 separate slender awns 1-2 inches long: palet obovate, thin, about ½ line long. On prairies and ridges, eastern Washington to Brit. Columbia, Idaho and Texas.

A. oligantha Michx. Fl i, 41. Glabrous annual: stems slender, 1-2 feet high, erect, dichotomously branched, smooth or roughish: sheaths loose, longer than the internodes: ligules very short, minutely ciliate: leaves 1-6 inches long, ½-1 line wide, smooth, the larger ones attenuate into a long slender point: spikelets few, borne in a lax spike-like panicle: first glume 5-nerved, an inch long, attenuate or short-awned equalling or shorter than the second which bears an awn 2-4 lines long: flowering glume shorter than the first one, bearing 3 slender divergent or spreading awns, the middle one 1-3 inches long, the lateral ones somewhat shorter.

On dry plains, southern Oregon to the Eastern States.

A. fasciculata Torr. Ann. Lyc. N. Y. i, 154. Glabrous: stems slender, erect, 1-2 feet high, often branched at the base: sheaths shorter than the internodes: ligules short, ciliate: leaves erect, 6 inches long, 1 line wide or less, flat, attenuate to a long point, smooth or scabrous: panicle 3-7 inches long, at first strict, its branches finally more or less spreading: first glume linear 1-nerved, shorter than the second, 4-5 lines long: second one similar, about 6 lines long: flowering glumes about equalling the second one terminating in 3 nearly equal slender awns 6-8 lines long. On dry plains, Idaho to California and Kansas.

24 PHLEUM L. Sp. 59.

Annual or perennial grasses with flat leaves and numerous spikelets in dense spicate panicles. Spikelets one-flowered. Glumes 3, the 2 lower ones empty, membranous, compressed, keeled, the apex obliquely truncate, the midnerve produced into an awn. Flowering glume much shorter and broader, hyaline, truncate, denticulate at the summit. Palet narrow, hyaline. Stamens 3. Styles distinct, somewhat elongated, with plumose stigmas. Grain ovoid, loosely enclosed by the glume and palet.

P. pratense L. Sp. 59. Smooth or nearly so: perennial with bulbous roots: stems 1-4 feet high, erect, simple: sheaths usually exceeding the internodes, sometimes shorter, the upper ones long, and not inflated or very slightly so: ligules 1-2 lines long, rounded: leaves flat, 3-16 inches long, 2-3 lines wide, smooth or scabrous: panicle usually elongated, cylindrical 1-7 inches long: empty glumes exclusive of the awns $1\frac{1}{2}$ lines long ciliate on the keel, the awn less than half their length: flowering glume very thin, truncate: palet equalling the glume. Common in fields and waste places.

P. alpinum L. Sp. 59. Smooth or nearly so perennial: stems erect, 6-18 inches high, simple: sheaths often much shorter than the internodes, sometimes longer, the upper one usually much inflated: ligules about 1 line long, truncate: leaves smooth beneath, scabrous above, the lower 2-3 inches long, 1-4 lines wide, the upper one usually very short: panicle short and dense, ovoid to oblong, $\frac{1}{2}$ -2 inches long, 3-6 lines thick: empty glumes, exclusive of the awn $1\frac{1}{2}$ lines long, strongly ciliate on the keel, the awn about half as long as the body: flowering glume oblong. In wet meadows on high mountains, California to Alaska and across the continent.

25 ALOPECURUS L. Sp. 60.

Annual or perennial grasses with usually flat leaves and numerous spikelets in dense spike-like panicles. Spikelets one-flowered, flattened. Empty glumes acute, sometimes short-awned, more or less united below, compressed, keeled, the keel ciliate or somewhat winged. Flowering glume obtuse or truncate, hyaline, three-nerved, awned on the back. Palet hyaline, acute. Stamens three. Styles distinct or rarely united at base. Stigmas elongated, hairy.

A. AGRESTIS L. Sp. ed. 2, 89. Stems 1-3 feet high, erect, simple: sheaths shorter than the internodes: ligules 1 line long, truncate: leaves 2-7 inches long, 1-3 lines wide, scabrous, especially above: panicle $1\frac{1}{2}$ -4 inches long, 2-4 lines thick: empty glumes united at base for about half their length narrowly wing-keeled, 2-2 $\frac{1}{2}$ lines long, the nerves smooth or

scabrous, sometimes hispid below: flowering glume equalling or exceeding the outer ones, smooth, the awn inserted near the base, about twice its length. In waste places and ballast grounds, introduced from Europe.

A. geniculatus L. Sp. 60. Stems slender, 6-18 inches high, erect with decumbent geniculate base, simple or sparingly branched, smooth: sheaths usually shorter than the internodes, loose or somewhat inflated: ligules 1-3 lines long: leaves 1-6 inches long, $\frac{1}{2}$ -2 lines wide, scabrous, especially above: panicle 1-3 inches long, $\frac{1}{2}$ -2 lines thick: empty glumes slightly united at base, 1-1 $\frac{1}{4}$ lines long, obtuse or subacute, glabrous except on the pubescent lateral nerves and strongly ciliate keel: flowering glume somewhat shorter, obtuse, glabrous, the awn inserted at or below the middle, equalling or exceeding it. Common in wet places, California to Alaska and across the continent.

Var. robustus Vasey Bull. Torr. Bot. Club xv, 13. Stems 20-30 inches long, sometimes branched: leaves flat, hispid above, 3-6 inches long, 2-3 lines wide. In the mountains, Washington to Alaska.

A. PRATENSIS L. Sp. 60. Stems slender 12-30 inches high, simple, erect: sheaths usually much shorter than the internodes, loose or somewhat inflated: ligules about $\frac{1}{2}$ line long, erose-truncate: leaves 2-4 inches long, 1-3 lines wide, scabrous, at least above: panicle 1-3 inches long: 4-6 lines wide: outer glumes, united at base for about $\frac{1}{4}$ their length, 2-3 lines long, acute, glabrous except the sparingly pubescent lateral nerves and the strongly ciliate keel: flowering glume slightly shorter, obtuse, glabrous, the awn inserted about $\frac{1}{4}$ way from the base and surpassing it. Common in cultivation and waste places: naturalized from Europe.

A. Californicus Vasey l. c. Stems slender, smooth, geniculate below, 10-15 inches long often branched: sheaths loose, the upper one inflated, smooth, shorter than the internodes: ligules about 2 lines long, acute: leaves 1-5 inches long, flat, hispid above: panicle cylindrical, dense, 1-2 inches long, $\frac{1}{4}$ - $\frac{3}{8}$ line thick: empty glumes oblong, obtuse, carinate slightly united at base, thin, purple above, hairy on the keel, and slightly pubescent the obscure lateral nerves, 1 $\frac{1}{2}$ -1 $\frac{3}{4}$ lines long: flowering glume oblong-ovate, obtuse, its edges united $\frac{1}{4}$ way from the base, smooth, about equaling the lower ones: awn arising near the base of the glume twisted, bent near the middle, 2-3 lines long: palea wanting. In wet places, California to the Willamette Valley Oregon and Idaho.

A. pallescens Piper Fl. Palouse Reg. 18. A pale green smooth tufted perennial: stems 16-24 inches high, erect, or slightly geniculate below: sheaths shorter than the internodes, inflated, smooth: ligules scabrous, 1 $\frac{1}{2}$ -2 lines long: leaves flat, 3-12 inches long. 1-3 lines wide, acuminate, strongly scabrous above: panicle usually well exerted, pale and silvery, 1-3 inches long, about 3 lines thick, erect: empty glumes nearly equal, 1-3 lines long, strongly ciliate on the keel, obtuse: flowering glume hyaline, 2-nerved, as long as the outer ones, obtuse: awn arising near the base, stout bent, 3 lines long. Common in wet places about Pullman Washington.

A. saccatus Vasey Bot. Gaz. vi, 290. Tufted, apparently annual: stems erect, or slightly geniculate at base 5-10 inches high, smooth, simple: sheaths rather loose, the upper one inflated, slightly roughened usually shorter than the internodes: ligules membranaceous, 1 $\frac{1}{2}$ lines long: leaves narrow, rough on both sides, 1-3 inches long: empty glumes united at base, ovate-oblong, barely acute, carinate, scabrous at the apex, puberulent throughout, ciliate on the keel and lateral nerves, 2 lines long: flowering glume broadly oblong, truncate, the margins united to the middle or above, smooth except the ciliate apex, 4-nerved, 2 lines long: awn arising near the base of the glume, twisted, bent 3-4 lines long. palea wanting. On the margins of pools that are dry in summer, eastern base of the Cascade Mountains at Barlow Gate, Oregon.

A. Howellii Vasey Bull. Torr. Bot. Club, xv, 12. A low tufted annual, often purplish throughout: stems erect, or somewhat geniculate at base, mostly simple, smooth, 3-6 inches high: sheaths loose or vaginate, the upper one more inflated, smooth, the lower shorter than the internodes, the upper one exceeding the internode, with a short blade: ligules membranous, obtuse, 1 line long: leaves filiform-convolute, exceeding the stem: panicle cylindric, 1 inch long, usually included at base: empty glumes slightly united at base, oblong, obtuse, carinate, scarious on the margins, ciliate on the keel and silky on the lateral nerves and near the base, $1\frac{1}{4}$ - $1\frac{1}{2}$ lines long: flowering glume broadly ovate oblong, truncate, thin, smooth, 4-nerved, equalling the empty ones: awn arising below the middle of the glume, slender, naked below, bent, 3 lines long: palet wanting. Margins of small pools that are dry in summer, on the rocky plains near Medford southern Oregon.

A. occidentalis Scribn. Bot. Gaz. xi, 170. Stems rather slender, 2-3 feet high: sheaths loose, shorter than the internodes: leaves flat, 2-4 inches long: panicle oblong, an inch long: outer glumes united at the base, about 2 lines long, acute, pubescent with short hairs, the keel ciliate with long hairs: flowering glume a little shorter than the outer ones, glabrous except at the villous apex: awn inserted below the middle, straight, much exceeding the glume. Wet meadows and banks of streams, in the high mountains, Idaho to Montana and Colorado.

Tribe 5 Avenæ. Spikelets two- to several-flowered. Outer empty glume usually longer than the first flowering one. One or more of the flowering glumes awned on the back, or from between the teeth of the bifid apex. Awn usually twisted or geniculate. Callus and usually the joints of the rachis hairy.

26 DANTHONIA DC. Fl. Fr. iii, 32. (1805.)

Mostly perennial grasses with flat or convolute leaves and contracted or open panicles. Spikelets 3- to several-flowered, the flowers all perfect, or the upper staminate, pubescent, extended beyond the flowers. Glumes 5 to several, the 2 lower empty, keeled, acute, subequal, persistent, generally exceeding the uppermost flowering one. Flowering glumes rounded on the back, 2 toothed, deciduous, the awn arising from between the acute or awned teeth, flat and twisted at base, bent. Palet hyaline 2-keeled near the margins, obtuse or 2-toothed. Stamens, 3. Styles distinct, with plumous stigmas. Grain free, enclosed in the glume.

D. Californica Bolander Proc. Calif. Acad. ii, 182. Stems slender, 1-4 feet high, erect, or geniculate at the lower nodes, smooth: leafy nearly so the top: sheaths rather loose, closed at the hairy throat, usually pubescent mostly shorter than the internodes: ligules nearly obsolete: leaves of the radical shoots numerous, with short sheaths and slender involute blades 4-8 inches long; of the stem with flat or loosely involute blades, scabrous, especially toward the involute point, often thinly pubescent, 2-5 inches long: inflorescence a short simple panicle: spikelets cuneate, composed, 5-8-flowered: empty glumes lanceolate, with long carinate or in lute points, 6-7 lines long: flowering glumes broadly lanceolate, acuminate with 2 teeth 1 line long at the apex, smooth except a tuft of pilose hairs on each margin, or often slightly ciliate throughout: awn inserted at the base of the sinus, slightly hispid, often twisted and bent, 3-5 lines long: palet oblong, 3-toothed at the apex. In moist ground, Washington to California.

D. intermedia Vasey Bull. Torr. Bot Club x, 52. Densely tufted:

stems slender 1-2 feet high: leaves of sterile shoots with crowded sheaths and narrow involute blades, sparsely pilose to glabrous, 4-12 inches long: sheaths of the stem shorter than the internodes, more or less pilose: ligules short, ciliate: inflorescence a short spicate panicle of 3-12 erect spikelets: empty glumes lanceolate, acute or acuminate, keeled, smooth, 4-5 lines long, exceeding the flowering glumes which are broadly lanceolate, 2-3 lines long, acutish, 2-toothed, the awn more or less bent and twisted, 4-6 lines long. On low prairies, eastern Washington to southern California Montana and Canada.

Var. Cusickii Williams. Larger: leaves longer flatter, softer, less scabrous, quite destitute of pubescence, rather large spikelets and usually more open panicle. In the Blue Mountains of Oregon.

D. unispicata Munro. Stems loosely tufted, 6-12 inches high: sheaths shorter than the internodes, or the lower ones longer, pubescent with long white hairs: ligules very short or reduced to a row of white hairs: leaves flat or more or less involute with acuminate tips, 2-4 inches long, more or less pubescent: inflorescence a single terminal spikelet: empty glumes lanceolate, long-acuminate, exceeding the upper flowering one, glabrous, 6-12 lines long: flowering glumes lanceolate, acute, 4-5 lines long, terminating in 2 usually dark-colored awns, ciliate on the margins: central awn twisted and bent below the middle, about 6 lines long. In partially barren places, eastern Washington to California.

D. Americana Scribn. U. S. Dept. Agr. Cir. 30, 5. A slender densely caespitose perennial 8-16 inches high, with short slightly inflated sheaths, narrow mostly involute leaves and simple panicles of 1-4 large spikelets: sheaths much shorter than the internodes, pubescent, at least the lower ones long-bearded at the throat: empty glumes acuminate-lanceolate the narrowed apex obtuse, 6-9 lines long, as long as or slightly exceeding the flowers: flowering glumes 3-4 lines long, rounded and glabrous on the back, densely silky villous on the margins from just above the base to a little above the middle, abruptly 2-toothed, the teeth very slender bristles 2-3 lines long: awn very slender twisted below, 3-5 lines long. Brit. Columbia to California and Chile.

27 AVENA L. Sp. 76.

Annual or perennial grasses with usually flat leaves and numerous spikelets in panicles. Spikelets one- to several-flowered, the lower flowers perfect, the upper often staminate or imperfect. Glumes 3 to several the 2 outer empty, somewhat unequal, membranous, persistent. Flowering glumes deciduous, rounded on the back, acute, generally bearing a dorsal awn, the apex often 2-toothed. Palet narrow, 2-toothed. Stamens 3. Styles short, distinct, with plumose stigmas. Grain oblong, deeply furrowed, enclosed in the glume and palet, free or sometimes attached to the palet.

A. FATUA L. Sp. 80. Stems stout, 1-4 feet high, erect, smooth: sheaths, smooth, or scabrous at the summit, sometimes sparingly hirsute, the lower often longer than the internodes: ligules 1-2 lines long: leaves 3-8 inches long, 1-4 lines wide: panicle open 4-12 inches long, the branches ascending: spikelets 2-4 flowered, drooping: empty glumes 9-12 lines long, smooth, flowering glumes 6-9 lines long, with a ring of stiff brown hairs at base, pubescent with long rigid brown hairs, bearing, a long bent and twisted awn. In fields and waste places: naturalized from Europe.

VAR. GLABRESCENS Coss. Stems stout, pale, $1\frac{1}{2}$ - $2\frac{1}{2}$ feet high: sheaths equalling the internodes: leaves flat, 4-6 inches wide: flowering glumes

smooth except the ring of stiff white hairs at the base, and the scabrous apex. In cultivated fields and waste places: naturalized from Europe.

A. Smithii Porter, Gray Man. ed. 3, 640. Stems 2-5 feet high, erect, simple, scabrous: sheaths shorter than the internodes, very rough: ligules 2 lines long: leaves 4-8 inches long, 3-6 lines wide, scabrous: panicle 6-12 inches long, the branches finally spreading: spikelets 3-6-flowered: empty glumes smooth, the second 3-4 lines long, 3-nerved: flowering glumes 5 lines long, naked at base, strongly nerved, scabrous, bearing an awn $\frac{1}{4}$ - $\frac{1}{2}$ their length. Eastern Washington to Michigan.

28 TRisetum Pers. Syn. i, 97. (1805.)

Mostly perennial tufted grasses with flat leaves and spike-like or open panicles. Spikelets 2-4-flowered, the flowers all perfect or the uppermost staminate. Rachella glabrous or pilose, extended beyond the flowers. Glumes 4-6, membranous, the two lower empty, unequal, acute, persistent. Flowering glume usually shorter than the empty ones, deciduous, 2-toothed, bearing a dorsal awn below the apex, or the lower one sometimes awnless. Palet narrow, hyaline, 2-toothed. Stamens 3. Styles distinct. Stigmas plumose. Grain free, enclosed in the glume.

T. barbatum Steud. Syn. Pl. Gram. 229. Stems erect, or decumbent at base, often branched below, smooth, leafy nearly to the panicle, 1-3 feet high: sheaths sparsely retrorsely hispid, half open above, shorter than the internodes: ligules obtuse, erose, 1 line or less long: leaves 3-6 inches long, 2-3 lines wide, scabrous, sparsely pubescent or nearly smooth: panicle open to constricted, 4-8 inches long, its branches 3 inches long or less: spikelets loosely 3-6-flowered, 7-10 lines long; first empty glume very narrowly ovate, subulate-acute, smooth except the slightly hispid prominent keel, 3-4 lines long; second one lanceolate, acute, 5-6 lines long: flowering glumes lanceolate, with 2 teeth about $\frac{1}{2}$ line long, pubescent, 5-7 lines long: awn inserted at the base of the sinus bent, hispid and twisted below: palet linear thin. Washington to California.

T. canescens Buckley Proc. Acad. Phil. 1862, 100. Stems erect, nearly smooth, 2-3 feet high: sheaths open above, canescent to nearly smooth, shorter than the internodes: ligules ovate, erose or lacerate, 2-3 lines long: leaves flat, 4-10 inches long, 3-4 lines wide, canescent to nearly smooth: panicle narrow, 6-8 inches long, its branches unequal, 2 inches or less long, erect: spikelets slightly compressed, 3-4 lines long, 2-flowered or with only 1 imperfect one: first empty glume narrowly ovate, acute, slightly carinate, thin, hispid on the keel, $1\frac{1}{2}$ -2 lines long; second one broadly lanceolate, acute, about 3 lines long: flowering glume ovate-lanceolate, cleft $\frac{1}{2}$ way from the apex, minutely scabrous, 3 lines long: awn attached at the base of the cleft, hispid, twisted and bent. Common in wooded distr California to Alaska.

T. cernuum Trin. Mem. Acad. St. Petersburg. 1830, i, 61. Stems slender, erect, smooth, 2-3 feet high: sheaths loose, open above, smooth or scabrous above, shorter than the internodes: ligules ovate, lacerate: 1-6 lines long: leaves flat, scabrous on both sides or nearly smooth beneath, 5-10 inches long, 3-6 lines wide: panicle rather loose, nodding, 5-8 inches long, its branches slender, ascending: spikelets 2-4-flowered, 3-4 lines long: first empty glume narrowly ovate, carinate 1- $1\frac{1}{2}$ lines long; second one broadly oblong, obtuse or acuminate, thin, hispid on the keel above, 3-nerved below, 2- $2\frac{1}{2}$ lines long: awn arising below the base, of the cleft, 3-5 lines long. Along streams in the mountains, California to Alaska.

T. subspicatum Beauv. Agrost. 180. Softly pubescent to glabrous:

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**AIRA
DESCHAMPSIA**

GRAMINEÆ

745

stems simple, erect, 6-20 inches high: sheaths usually shorter than the internodes: ligules $\frac{1}{2}$ -1 line long: leaves 1-4 inches long, 1-2 lines wide: panicle spike-like, 1-5 inches long, often interrupted below, its branches $1\frac{1}{2}$ inches long or less, erect: spikelets 2-3-flowered, the empty glumes hispid on the keel, shining, the second about $2\frac{1}{2}$ lines long: flowering glumes 2- $2\frac{1}{2}$ lines long, acuminate, scabrous: awn inserted below the sinus, bent and twisted below. In rocky places in the high mountains, California to Alaska and across the continent.

Var. molle Gray Man. 641. Stems and leaves minutely soft-downy Range of the type.

29 AIRA L. Sp. 63.

Mostly annual grasses with narrow leaves and contracted or open panicles. Spikelets small, two-flowered, both flowers perfect. Glumes 4, the two lower empty, thin-membranous, acute, subequal, persistent: the flowering glumes usually contiguous, hyaline, mucronate or 2-toothed, deciduous, bearing a delicate dorsal awn inserted below the middle. Palet a little shorter than the glume, hyaline, 2-nerved. Stamens 3, with plumose stigmas. Grain enclosed in the glume and palet and often adherent to them.

A. CARYOPHYLLEA L. Sp. 66. Smooth and glabrous throughout: stems 6-10 inches high, erect, from an annual root: sheaths mostly basal: ligules $1\frac{1}{2}$ lines long: leaves 6-25 lines long, involute-setaceous: panicle 1-4 inches long, open, the branches spreading or ascending: spikelets 1- $1\frac{1}{2}$ lines long, the empty glumes acute: flowering glumes very acute, 2-toothed 1 line long: awn 1-2 lines long. Common in dry open places: naturalized from Europe.

A. PRÆCOX L. Sp. 65. Smooth throughout: stems 1-4 inches high, erect, from an annual root, simple, rigid: sheaths shorter than the internodes: ligules about $1\frac{1}{2}$ lines long: leaves 1 inch long or less, involute-setaceous: panicle contracted, strict, 6-12 lines long, its base often enclosed in the upper sheath: spikelets about $1\frac{1}{2}$ lines long, the empty glumes acute: flowering glumes acuminate, 2-toothed at the apex, about $1\frac{1}{2}$ lines long: awn straight, 1-2 lines long. In dry places: naturalized from Eu.

30 DESCHAMPSIA Beauv. Agrost. 91. (1812.)

Perennial grasses with flat or involute leaves and numerous flowers in contracted or open panicles. Spikelets 2-flowered, both perfect; the hairy rachella extended beyond the flowers or rarely terminated by a staminate one. Glumes 4, rarely more, the 2 lower empty, keeled, acute, membranous shining, persistent; the flowering glumes of about the same texture, deciduous, 2-toothed at the apex and bearing a dorsal awn. Palet narrow, 2-nerved. Stamens 3. Styles distinct. Stigmas plumose. Grain free, enclosed in the glume.

D. cespitosa Beauv. Agrost. 160, t. 13, fig. 3. Densely cespitose with very numerous basal leaves: Stems erect, slender 2-4 feet high; simple, glabrous: sheaths much shorter than the internodes: ligules 1-3 lines long: leaves flat 1- $1\frac{1}{2}$ lines wide, smooth beneath, strongly scabrous above, the basal ones $\frac{1}{4}$ - $\frac{1}{2}$ as long as the stem, those of the stem 2-6 inches long: panicle open 3-6 inches long, the branches widely spreading or ascending often somewhat flexuous the lower 2-5 inches long: spikelets $1\frac{1}{2}$ -2 lines long: empty glumes unequal, lanceolate, acute; flowering glume oblong,

about $1\frac{1}{4}$ lines long, erose-truncate at the apex: awn straight, inserted above the middle, 1-2 lines long. Common in moist meadows, California to Alaska and across the continent.

D. atropurpurea Scheele Flora xxvii, 56. Stems 6-18 inches high, erect, simple, rigid: sheaths shorter than the internodes: ligules truncate, 1 line long or less: leaves 2-5 inches long, 1-2 lines wide, flat: panicle 1-2 inches long, narrow, usually purple or purplish, its branches erect, or sometimes ascending, the lower 6-18 lines long: empty glumes broadly lanceolate, acute, $2\frac{1}{2}$ lines long: flowering glumes oblong, erose-truncate at the apex, about $1\frac{1}{4}$ lines long: awn bent and much exceeding the glume, Alpine summits of the high mountains, Oregon to Alaska and across the continent.

D. elongata Munro in Benth. Pl. Hartw. 242, t. 228. Densely caespitose perennial: stems very slender, 1-2 feet high, simple, erect: leaves very numerous, mostly basal, 1-18 inches long, flat and smooth, less than 1 line wide: ligules elongated: panicle very long and narrow, 4-12 inches long, its very unequal scabrous capillary branches mostly appressed: empty glumes about 2 lines long, linear-subulate, nearly equal, green and scabrous on the keel: flowering glumes about 1 line long, smooth and shining, with a silky tuft at base, irregularly 5-toothed above, with a very slender awn 2 lines long from near the base, Common in open woods, California to Washington, west of the Cascade Mountains.

D. calycina Presl Rel. Hænk. i, 251. Loosely tufted annual: stems slender, 2-24 inches high, sometimes geniculate and sparingly branched below: leaves very narrow those of the stem 1-2 inches long, with elongated ligules: panicle very loose, and open, 1-12 inches long, the lower branches in threes, the others in pairs or solitary, distant, mostly spreading: empty glumes 3 lines long or more, linear-lanceolate, green and rough on the keel: flowering glumes about a line long, shining below its truncate 4-toothed apex, the hairs at base $\frac{1}{4}$ as long: awn inserted just below the middle, about 3 lines long, twisted below and bent near the middle common in places that are wet in spring. California to Washington.

31 ARRHENATHERUM Beauv. Agrost. 55, t. 11, fig. 5.

Tall perennial grasses with flat leaves and narrow or open panicles. Spikelets 2-flowered, the upper flower perfect, the lower staminate the rachella extended beyond the flowers. Glumes 4, the 2 lower empty, thin-membranous, keeled, very acute or awn-pointed, unequal, persistent: flowering glumes rigid 5-7-nerved deciduous, the first bearing a long bent and twisted dorsal awn inserted below the middle, the second unarmed. Palet hyaline, 2-keeled. Stamens 3. Styles short distinct. Stigmas plumose. Grain ovoid free.

A. ELATIUS Beauv. M. & F. Deutsch. Fl. i, 546. Glabrous perennial: stems 2-4 feet high, erect, simple: lower sheaths longer than the internodes: ligules 1 line long: leaves 2-12 inches long, 1-4 lines wide, scabrous: panicle 4-12 inches long, narrow, branches erect, the lower 1-2 inches long, empty glumes finely roughened, the second 4 lines long, nearly twice as long as the first one: flowering glumes about 4 lines long. In meadows and waste places; naturalized from Europe.

31 HOLCUS L. Sp. 1047.

Annual or perennial grasses with flat leaves and open or spike-like panicles. Spikelets dioecious, 2-flowered, the lower flower

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H. LANATUS L. Sp. 1048. Light green, densely and softly pubescent stems $1\frac{1}{2}$ -2 feet high, erect, often decumbent at base, simple: sheaths shorter than the internodes: ligules $\frac{1}{2}$ -1 line long: leaves 1-6 inches long, 2-3 lines wide: spikelets 2 lines long: empty glumes about 2 lines long, white villous, the upper awn-pointed: flowering glumes 1 line long, smooth, glabrous and shining, the lower sparsely ciliate on the keel, somewhat obtuse, the upper 2-toothed and bearing a hooked awn just below the apex. Common in meadows and waste places: introduced from Europe.

Tribe 4 Festucaceæ. Spikelets two- to several-flowered, usually hermaphrodite, pedicellate, in panicles or racemes, the former sometimes dense and spike-like. Flowering glumes usually longer than the empty ones, awnless or with one to several mostly straight awns which are either terminal or borne just below the apex.

33 *MUNROA* Torr. Pac. R. Rep. iv, 158. (1856.)

Low diffusely branched grasses with flat pungently pointed leaves and few flowers in panicles. Spikelets in clusters of 3-6. Nearly sessile in the axils of the floral leaves, 3-5-flowered, the flowers all perfect. Glumes 5-7, the two lower empty, lanceolate, acute, 1-nerved, hyaline. Flowering glume larger, 3-nerved, one or two empty ones above the flowering ones. Palets hyaline. Stamens 3. Styles distinct, elongated: stigmas barbellate or short-plumose. Grain free, enclosed in the glume and palet.

M. squarrosa Torr. l. c. Stems 2-8 inches long, tufted, erect, decumbent or prostrate, much branched: sheaths short, crowded at the nodes and at the ends of the branches, smooth, pilose at the base and throat, sometimes ciliate on the margins: ligules a ring of hairs: leaves 1 inch long or less, 1-6 lines wide, rigid, scabrous: spikelets 2-5-flowered, the flowers perfect: empty glumes 1-nerved: flowering glumes 2-2½ lines long, longer than the empty ones, 3-nerved, the nerves excurrent and forming 3 teeth or awns, with tufts of hairs about the middle: palets obtuse. On dry plains, eastern Oregon to Alberta and Texas.

34 *PHRAGMITES* Trin. Fund. Agrost. 134.

Tall perennial grasses with broad flat leaves and very numerous flowers in ample panicles. Spikelets 3- to several-flowered, the first flower often staminate, the others perfect. Rachella articulated between the flowering glumes, long-pilose. Two lower glumes empty, unequal, membranous, lanceolate, acute, shorter than the spikelet, the third glume empty or subtending a staminate flower. Flowering glumes glabrous, narrow, long-acuminate, much exceeding the short palets. Stamens 3. Styles distinct, short. Stigmas plumose. Grain free, loosely enclosed in the palet and glume.

P. communis Trin. l. c. Stems stout, 3-15 feet high, erect, from long

horizontal perennial rootstocks, glabrous: sheaths shorter than the internodes, loose: ligules a ring of very short hairs: leaves 6-18 inches long, 4-9 lines wide: spikelets crowded on the ascending branches: first glume 1-nerved, $\frac{1}{2}$ - $\frac{3}{4}$ as long as the second one: flowering glumes 5-6 lines long, 3-nerved, long-acuminate, equalling the hairs of the rachella. In bogs and wet places nearly throughout North America: also in Europe and Asia.

35 DACTYLIS L. Sp. 71.

Tall perennial grasses with broad flat leaves and numerous spikelets crowded in paniculate short capitate clusters. Spikelets 3-5-flowered, all perfect or the upper staminate, the two lower glumes empty, thin-membranaceous, keeled, unequal, mucronate. Flowering glumes longer than the empty ones, rigid, 5-nerved, keeled, the midnerve extended into a point or short awn. Palea shorter than the glumes, 2-keeled. Stamens 3. Styles distinct. Stigmas plumose. Grain free, enclosed in the glume and palea.

D. GLOMERATA L. Sp. 71. Stems simple, erect, 2-4 feet high: sheaths shorter than the internodes: smooth or rough: ligules 1-2 lines long: leaves 3-9 inches long, 1-3 lines wide, flat, scabrous: panicle 3-8 inches long, its branches spreading or ascending in flower, erect in fruit, the lower 1-3 inches long, spikelet bearing from about the middle: spikelets in dense capitate clusters, 3-5-flowered: empty glumes 1-3-nerved, the first shorter than the second: flowering glumes 2-3 lines long, rough, pointed or short-awned, ciliate on the keel. In fields and waste places, naturalized from Europe.

36 KOELERIA Pers. Syn. 1, 97.

Tufted perennial or annual grasses with flat or setaceous leaves and numerous spikelets in spike-like panicles. Spikelets 2-5-flowered. Glumes 4-7, the two lower empty, narrow, acute, unequal, keeled, scarious on the margins. Flowering glumes 3-5-nerved. Palea hyaline, acute, 2-keeled. Stamens 3. Styles very short, with plumose stigmas. Grain free, enclosed in the glume.

K. cristata Pers. l. c. Stems erect, simple, rigid, often pubescent just below the panicle: sheaths often shorter than the internodes, smooth or scabrous, sometimes hirsute: ligules $\frac{1}{2}$ line long: leaves 1-12 inches long, $\frac{1}{2}$ -1 $\frac{1}{2}$ lines wide, erect, flat or involute, smooth or rough, often more or less hirsute: panicle 1-7 inches long, pale green, usually spike-like, the branches erect or rarely ascending, 1 inch long or less: empty glumes unequal, the first one about 2 lines long, scarious except the green keel; second one longer, scabrous on the keel; flowering glumes scarious, 1 $\frac{1}{2}$ -2 lines long. On sandy bars along rivers. California to Brit. Columbia and Pennsylvania.

37 EATONIA Raf. Journ. Phys. lxxxix 104.

Tufted perennial grasses with flat leaves and usually contracted panicles. Spikelets 2-3-flowered, the rachella extended beyond the flowers. Two lower glumes empty, shorter than the spikelet, the first linear acute, 1-nerved, the second much broader, 3-nerved, obtuse or rounded at the apex or sometimes acute, the margins scarious: flowering glumes narrow, usually obtuse. Palea narrow, 2-nerved. Stamens 3. Styles distinct, short. Stigmas plumose. Grain free loosely enclosed in the glume and palea.

E. obtusata Gray Man. ed. 2, 558. Stems often stout, 1-2½ feet high, erect, simple, smooth: sheaths shorter than the internodes, usually more or less rough, sometimes pubescent: ligules ¾-1 line long: leaves 1-9 inches long, 1-4 lines wide, scabrous: panicle 2-6 inches long, dense and usually spike-like, strict, the branches 1½ inches long or less, erect: spikelets crowded, 1¼-1½ lines long: empty glumes unequal, often purplish, the first narrow, shorter than and about ¼ as wide as the obtuse or almost truncate second one: flowering glumes narrow, obtuse, ¼-1 line long. California to Washington and the Eastern States.

E. Pennsylvanica Gray l. c. Stems slender, erect, smooth, 1-3 feet high: sheaths shorter than the internodes: ligules ¾ line long: leaves 2-7 inches long, 1-3 lines wide, rough: panicle 3-7 inches long, contracted, often nodding, lax, its branches 1-3 inches long: spikelets 1¼-1½ line long, usually numerous, somewhat crowded, and appressed to the branches: empty glumes unequal, the first narrow, shorter than and about ¼ as wide as the obtuse or abruptly acute second one which is smooth or somewhat rough on the keel: flowering glumes narrow, acute, 1¼ lines long. In moist soil, eastern Washington to the Eastern States.

38 MELICA L. Sp. 66.

Tall perennial grasses with flat leaves and contracted or open panicles. Spikelets 1- to several-flowered, often secund, rachella extended beyond the flowers and usually bearing 2-3 empty club-shape hooded scales, convolute around each other. Two lower glumes empty, membranous, 3-5-nerved; flowering glumes larger, rounded on the back, 7-13 nerved, sometimes bearing an awn, the margins more or less scarious. Palets broad, shorter than the glume, 2-keeled. Stamens 3. Style distinct. Stigmas plumose. Grain free enclosed in the glume and palet.

§ 1 EUMELICA. Empty glumes nearly or quite equalling the flowers. Flowering glumes scarious margined, obtuse and entire at the apex. Sterile flowers clavate, hooded, or like the others, but smaller.

M. interrupta Trin. Mem. Acad. St. Petersburg. 1840, 59. Stems tufted, slender, 1-3 feet high, from strong fibrous roots: leaves narrow, long-acuminate, from smooth to very scabrous and pilose-pubescent: panicle 8-12 inches long, its branches in remote fascicles, very unequal, the lower 1-3 inches long: spikelets 5 lines long, minutely scabrous, 1-flowered, with an imperfect floret: first empty glumes 3-nerved, second larger and indistinctly 5-nerved: flowering glume acutish, strongly 7-nerved, usually purplish above except the scabrous margins: palet about as long as the glume, 2-toothed: sterile flowers short-pedicelled, ½ as long as the perfect ones, sometimes enclosing a second one. Oregon to California.

M. stricta Bolander Proc. Cal. Acad. iii, 4. Densely tufted, 1-2 feet high, pale green: stems erect, or geniculate below, branched at base, softly pubescent to scabrous: sheaths retrorsely velvety-pubescent, longer than the internodes: ligules about 2 lines long: leaves 3-4 inches long, 1-2 lines wide, flat, or involute toward the rather rigid points, velvety-pubescent on both sides: panicle secund, of 6-12 nodding spikelets, the scabrous branches mostly single, erect, making the panicle appear single: spikelets 5-7 lines long, with 2-3 perfect flowers and rather large rudiments: empty glumes lance-oblong, narrowed below, obtuse or barely acute, thin smooth, 5-nerved, 4-6 lines long, the first slightly shorter: flowering glumes lanceolate, acute, minutely hispid, 7-nerved, 4½-5½ lines long: palet obovate-oblong, obtuse, minutely hispid, pubescent on the arched keels. In the high

mountains of eastern Oregon to California and Nevada.

M. bulbosa Geyer, Hook. Journ. Bot. viii, 19. Stems 1-3 feet high, enlarged and bulb-like at base: sheaths longer than the internodes, nearly smooth to scabrous: leaves 2-3 inches long setaceously convolute, nearly smooth to scabrous: ligules nearly 2 lines long, often coarsely lacerate: panicle strict, 4-8 inches long, interrupted below, the branches mostly in pairs, very unequal, erect: spikelets with 2-3 perfect flowers, about 4 lines long: empty glumes membranaceous, broad, obtuse, the lower 3-5-nerved, the upper 5-7-nerved: flowering glumes 3-4 lines long, scarious-margined, minutely scabrous, 7-nerved, the unequal nerves all ceasing below the broad hyaline obtuse apex: palet ciliate on the keels: sterile floret often double, the uppermost minute and hooded. About the base of cliffs, eastern Oregon to California.

M. fugax Bolander Proc. Cal. Acad. iv, 104. Stems slender, 6-12 inches high, enlarged and bulb-like at base: sheaths longer than the internodes, nearly smooth to scabrous: ligules about 1 line long, truncate at the apex: leaves flat or somewhat involute, 1-6 inches long, 1-2 lines wide, the lower obtuse or barely acute, the upper acuminate and often setaceously pointed: panicle 2-4 inches long, its branches mostly in pairs, erect or somewhat spreading, very unequal, the longest 1-2 inches long: spikelets 3-4 lines long, usually purplish, of 3-5 perfect flowers: empty glumes 3-5-nerved, obtuse, with broad scarious margins; the first about $1\frac{1}{2}$ lines long, the second broader and about 2 lines long; flowering glumes strongly 7-nerved, only the midnerve reaching the narrow scarious apex: palets slightly shorter than the glume, minutely ciliate: sterile flowers similar to the glumes. About the base of cliffs, eastern Washington to California.

§ 2 **BROMELICA** Thurber Bot. Cal. ii, 304. Spikelets of 3-8 perfect flowers, the lower exceeding the empty glumes. Flowering glumes prominently 7-nerved, apiculate or distinctly awned by the excurrent midnerve at the notched or bifid or narrowly truncate or long-attenuate tip.

M. bromoides Gray Proc. Am. Acad. viii, 409. Stems slender, 3-4 feet high, enlarged and bulb-like at base: lower sheaths longer than the internodes, the upper shorter, smooth: leaves flat, 6-12 inches long, setaceously acuminate: ligules about 1 line long or less, the upper ones often lacerate: panicle very loose, 6-8 inches long, very long-exserted, its capillary branches few and spreading, 2-3 inches long, bearing only one or two spikelets 6-8 lines long: first empty glume about 1 line long, acute, the second broader, nearly 2 lines long, obtuse or barely acute, with broad scarious margins: flowering glumes about 4 lines long, narrowly margined, lanceolate, acute: palet about 3 lines long, ciliate on the nerves. On open ridges southern Oregon to California.

Var. Howellii Scribn. Proc. Phila. Acad. 47. Panicle more open and fewer-flowered: flowering glumes longer and entire or but slightly notched at the apex. On dry ridges southwestern Oregon.

M. Harfordii Bolander Proc. Cal. Acad. iv, 102. Stems erect, branched below, slender, rather wiry, 1-3 feet high, not bulbous at base: sheaths slightly scabrous, about equalling the internodes: ligules 1-2 lines long, leaves flat or involute, scabrous above, slender-pointed, 6-10 inches long, 1-3 lines wide: panicle strict, 6-12 inches long, its scabrous branches erect: or appressed, unequal, 2 inches long or less bearing 1-3 erect spikelets: empty glumes oblanceolate, obtuse or barely acute, the first 5-nerved, 3-4 lines long, the second $\frac{1}{2}$ line longer and 5-7-nerved: flowering glumes lanceolate, barely acute or emarginate or sometimes short-awned, scarious-margined above, minutely appressed-silky throughout, pilose on the margin.

al nerves below the middle, 7-9-nerved, 4-5 lines long: palet oblong, obtuse or emarginate, pubescent on the 2 arched keels, 3-4 lines long. On open ridges in the mountains, Oregon to California.

Var. *minor* Vasey, Beal Grasses N. Am. II, 510. Stems slender, 10-15 inches high erect: panicles very simple, $1\frac{1}{2}$ -4 inches long: spikelets usually 3-flowered. On dry ridges in the Siskiyou Mountains.

M. aristata Thurber, Bolander Proc. Cal. Acad. iv, 103. Stems slender, tufted, 2-4 feet high: leaves flat, 2-4 inches long, 3 lines wide: panicle narrow, 5-12 inches long, its branches erect: spikelets 3-5-flowered, pale or purplish: first empty glume oblong, about 3 lines long; the second about a line longer: flowering glumes about 5 lines long, with a few stiff marginal hairs near the base, very scabrous, the central nerve excurrent just below the bifid tip as an awn 3-5 lines long: palet about $3\frac{1}{2}$ lines long, strongly ciliate at the apex. In mountains, Washington to California.

M. acuminata Bolander l. c. 104. Slender, erect, 2-3 feet high, with thickened bulbous base: sheaths mostly longer or shorter than the internodes, more or less pubescent: ligules long, lacinate: panicle 4-12 inches long, narrow, the capillary branches erect or barely spreading: spikelets 3-5-flowered, often purplish: first empty glume linear, about 2 lines long, much smaller than the acuminate second one: flowering glumes lanceolate, long-acuminate about 5 lines long, 5-7-nerved: ciliate on the margins below: palet about half as long as the glume, densely ciliate above, narrowly truncate. In open woods, California to Alaska.

M. spectabilis Scribn. Proc. Philad. Acad. 1885, 45. A slender tufted stoloniferous perennial: stems about $2\frac{1}{2}$ feet high, with a corm at the base of each: sheaths mostly longer than the internodes: ligules white, about 1 line long: leaves 3-4, flat or involute, scabrous, 7-10 inches long, 1-2 lines wide: panicle simple, 5-8 inches long, its slender branches solitary or in pairs, sometimes in threes, the longest $1\frac{1}{2}$ -2 inches long: spikelets 3-5-flowered: empty glumes ovate, obtuse or acute, with transverse nerves near the middle, the first 3-nerved, the second 5-nerved, $2\frac{1}{2}$ -3 lines long: flowering glumes $3\frac{1}{2}$ -4 lines long, abruptly tapering, oval, the apex with 2 very short teeth or a notch, 7-9-nerved: palet elliptical, $2\frac{1}{2}$ lines long. Oregon to Montana and California.

M. scabrata Scribn. Piper & Beattie Fl. Palouse Reg. 25. Stems mostly solitary, erect, 2-4 feet high, with bulbous base: sheaths nearly as long or longer than the internodes, scabrous: leaves flat, linear, 5-7 inches long, 1-2 lines wide, scabrous on both sides: panicle erect, narrow, 3-7 inches long, lower branches mostly in threes, the 2 outer short and bearing a single spikelet, the central one longer and bearing 2-5 spikelets 5-7-flowered, usually purple: lower empty glumes $2\frac{1}{2}$ lines long, the upper $3\frac{1}{2}$ -4 lines long, acutish: flowering glumes about $3\frac{1}{2}$ lines long all minutely scabrous. In low meadows about Pullman Washington.

39 DISTICHLIS Raf. Journ. Phys. lxxxix, 104.

Diocious grasses with rigid stems, creeping or decumbent at base, flat or convolute leaves, and numerous spikelets in spike-like panicles. Spikelets flattened, more numerous on the staminate plants than on the pistillate, 6-16-flowered. Rachella continuous in the staminate spikelets, articulated in the pistillate. Two lower glumes empty, narrow, keeled, acute, shorter than the flowering ones. Flowering glumes broader, many-nerved, acute, rigid. Palets 2-keeled. Stamens 3. Styles thickened at the base, rather long, distinct. Stigmas long-plumose. Grain free enclosed in the glume and palet.



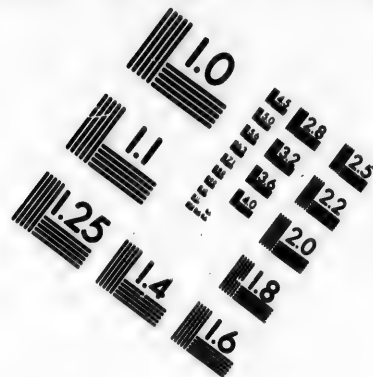
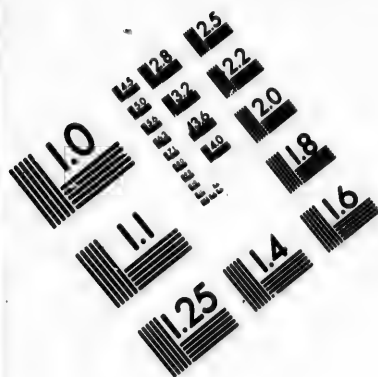
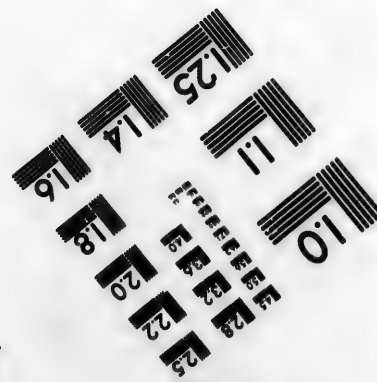
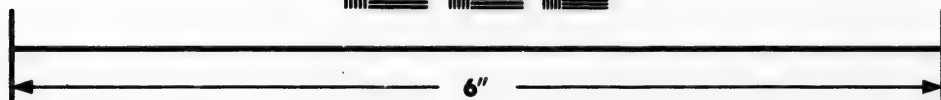
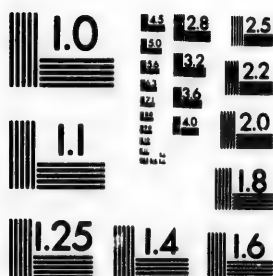


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D. maritima Raf. l. c. Glabrous throughout: stems 3 inches to 2 feet high, erect, from horizontal rootstock, often decumbent at base: sheaths shorter than the internodes, often crowded: ligules a ring of very short hairs: leaves $\frac{1}{2}$ -9 inches long, 1-2 lines wide, flat or involute: panicle dense and spike-like 1-3 inches long, the branches 1 inch long or less, erect: spikelets 6-16-flowered, 4-9 lines long, pale green or purplish: empty glumes acute, the first 1-3-nerved, $\frac{3}{4}$ as long as the 3-2-nerved, second one: flowering glume $1\frac{1}{2}$ -2 $\frac{1}{2}$ lines long, acute or acuminate. In salt marshes along the coast Brit. Columbia to California and in the interior, also on the Atlantic coast.

40 CATABROSA Beauv. Agrost. 97, t. 19, fig. 8.

Perennial grasses with soft flat leaves and open panicles. Spikelets usually 2-flowered. Two lower glumes empty, thin-membranaceous, much shorter than the flowering ones, unequal, rounded or obtuse at the apex. Flowering glumes membranous, erose-truncate. Palea barely shorter than the glume. Stamens 3. Styles distinct, with plumose stigmas.

C. aquatica Beauv. Agrost. 157. Smooth and glabrous: stems erect, from a creeping base, $\frac{1}{2}$ -2 feet high, bright green, flaccid: sheaths usually longer than the internodes, loose: ligule $1\frac{1}{2}$ -5 inches long, 1-3 lines wide, flat, obtuse: panicle 1-8 inches long, open, the branches whorled, spreading or ascending, very slender $\frac{1}{2}$ -2 inches long, spikelets $1\frac{1}{2}$ -1 $\frac{3}{4}$ lines long, the empty glumes rounded or obtuse, the first about half as long, as the second which is crenulate on the margins: flowering glumes 1-1 $\frac{1}{4}$ lines long, 3-nerved, erose-truncate at the apex. In water or wet places, Washington to Alaska and Labrador to Nebraska: also Europe and Asia.

41 GRAPHEPHORUM Desv. Bull. Soc. Philom. ii, 189.

Erect grasses with flat leaves and usually contracted nodding panicles. Spikelets 2-4-flowered, flattened, the rachella prolonged beyond the flower. Glumes 4-6, the 2 lower ones empty, somewhat shorter than the flowering ones, thin-membranaceous, acute, keeled. Flowering glumes membranous, obscurely nerved, entire, sometimes short-awned just below the apex. Stamens 3. Styles distinct, with plumose stigmas. Grain glabrous.

G. Welfii Vasey Des. Cat. Gr. U. S. 66. Stems slender, 15-30 inches high, from a perennial root: sheaths about as long as the internodes: ligules about a line long: leaves flat, scabrous, 6-10 inches long, 2-3 lines wide: panicle erect, subspicate, 3-9 inches long: spikelets 2-4-flowered, purplish: rachella villous: empty glumes elliptical, nearly equal, about 3 lines long the first 1-nerved, the second 3-nerved: flowering glumes 2-2 $\frac{1}{2}$ lines long, less than 1 line wide, obscurely 5-nerved, obtuse, lacerate, sometimes split or 2-toothed, bearing an awn $\frac{1}{4}$ line long: palea shorter than or nearly equalling the glumes. Dry rocky slopes, eastern Oregon to Montana and California.

42 PANICULARIA Fabr. Enum. Hort. Helmst. 373. (1763.)

GLYCERIA R. Br. (1810.)

Mostly perennial grasses with flat leaves and numerous spikelets in more or less open panicles. Spikelets 2-20-flowered, terete or sometimes flattened. Two lower glumes empty, obtuse or acute, 1-3-nerved: flowering glumes membranous, rounded on the back, 5-9-nerved, the nerves disappearing in the hyaline apex.

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Palets scarcely shorter than the glumes, rarely longer, 2-keeled. Stamens 2 or 3. Styles distinct, with plumose stigmas. Grain smooth, enclosed in the glume and partly free, or when dry slightly adhering to the palet.

P. fluitans Kuntze Rev. Gen. Pl. 782. *G. fluitans* R. Br. Stems 2-5 feet high, erect: stout, simple smooth, often rooting from the lower nodes: sheaths loose, generally longer than the internodes smooth or rough: ligules 2-3 lines long: leaves 5-12 inches long, 2-6 lines wide scabrous: often floating: panicle 9-18 inches long; the lower branches at first appressed, later ascending 3-6 inches long: spikelets linear, 7-13-flowered, 4-12 lines long: empty glumes unequal, 1-nerved, the lower acute or obtuse, the upper obtuse or truncate. In water and bogs, California to Alaska and across the continent.

P. borealis Nash Bull. Torr. Bot. club xxiv, 348. Stems weak, erect, glabrous, $1\frac{1}{2}$ -3 feet high: sheaths loose, longer than the internodes: leaves 4-10 inches long, pale green, nearly smooth: panicle lax, 7-15 inches long, the branches single or in pairs usually short and erect: spikelets linear, 5-7 lines long: flowering glumes very thin, $1\frac{1}{2}$ -2 lines long, 7-nerved, the nerves minutely hispid. In shallow ponds, eastern Washington to California and the Eastern States.

P. nervata Kuntze l. c. *G. nervata* Trin. Stems slender, erect, 1-3 feet high, simple, smooth: sheaths shorter than the internodes, usually more or less rough: ligules $\frac{1}{2}$ line long, truncate: leaves 6-12 inches long, 2-5 lines wide, acute, smooth beneath, rough above: panicle 3-8 inches long, open, the filiform branches spreading, ascending or often drooping, rarely erect, the lower ones 2-5 inches long: spikelets 3-7-flowered, $1\frac{1}{2}$ - $1\frac{3}{4}$ lines long: empty glumes obtuse, 1-nerved; flowering glumes about $\frac{3}{4}$ line long, obtuse or rounded at the apex, with 7 sharp distinct nerves and evident furrows between them. Common in wet places and along streams, California to Alaska and across the continent.

P. pallida Kuntze l. c. 783. Pale green, stems 1-3 feet long, assurgent, simple, smooth: sheaths loose, shorter than the internodes, ligules 2-3 lines long, acute: leaves 2-6 inches long, 1-2 lines wide, smooth beneath, rough above: panicle 2-7 inches long, the branches erect or ascending, often flexuous, 1-2 inches long: spikelets 4-8-flowered, $2\frac{1}{2}$ - $3\frac{1}{2}$ lines long: empty glumes unequal, the first 1-nerved, obtuse, shorter than the 3-nerved and truncate second one: flowering glumes $1\frac{1}{2}$ - $1\frac{3}{4}$ lines long, truncate and denticulate at the apex, sharply and distinctly 7-nerved, with plain furrows between the nerves. In shallow water, Washington to Indiana and New Brunswick.

P. pauciflora Kuntze l. c. *G. pauciflora* Presl. Stems stout, 2-4 feet long: sheaths nearly smooth, loose, usually longer than the internodes: ligules rounded or more often lacerate 2-3 lines long: leaves 6-15 inches long: 3-9 lines wide: panicle 5-8 inches long, somewhat contracted and flexuous or at length loose and open, usually purplish, its branches hispid, 4 inches long or less: spikelets 5-7-flowered, 2-3 lines long: empty glumes less than half as long as the flowering ones, the first ovate, denticulate, near the subacute apex, smooth, 1-nerved $\frac{1}{2}$ line long: the second cross at the rounded apex, 3-nerved, nearly 1 line long: flowering glumes broadly oblong, cross at the rounded scarious apex, hispidulous on the keel, prominently 5-nerved, $1\frac{1}{2}$ - $1\frac{3}{4}$ lines long: palet oblong, emarginate, slightly pubescent on the 2 keels, nearly equalling the glume. In shallow water or wet places, California to Alaska and Colorado.

P. Americana MacM. Met. Minn. 81. Stems stout, erect, simple, smooth, 3-5 feet high: sheaths loose, smooth or somewhat rough: ligules 1-3 lines long, truncate: leaves 7-12 inches long, 2-3 lines wide, usually smooth beneath, rough above: panicle 8-16 inches long, its branches spreading, ascend-

ing or rarely erect, 4-8 inches long, spikelets 4-7-flowered, 2-3 lines long: empty glumes acute, 1-nerved: flowering glumes about 1 line long, obtuse or rounded at the apex, sharply and distinctly 7-nerved, the furrows between the nerves evident. In wet soil, Alaska to California and Neb.

43 PUCCINELLIA Parl. Fl. Ital. i, 366.

Perennial grasses with flat or involute leaves and contracted or open panicles. Spikelets 2-10-flowered. Two lower glumes empty: obtuse or acute, unequal: flowering glumes obtuse, or acute, rounded on the back, 5-nerved, the nerves very obscure or almost wanting. Palets about equalling the glumes. Stamens 3. Stigmas sessile, simply plumose. Grain compressed, usually adhering to the palet.

P. maritima Parl. l. c. 370. Stems stoloniferous, 6-24 inches high, erect, or decumbent at base, smooth, simple: sheaths usually exceeding the internodes: ligules $\frac{1}{2}$ -1 line long: leaves 1-5 inches long, 1 line wide or less, flat to involute: panicle 2-6 inches long, open, its branches ascending or rarely erect, 1-2 inches long: spikelets 3-10-flowered, 3-7 lines long: empty glumes unequal, the first usually 1-nerved, the second 3-nerved: flowering glumes $1\frac{1}{2}$ -2 lines long, obtuse or truncate. In salt marshes along the coast.

P. angustata Nash Bull. Torr. Bot. Club xxix, 513. *Poa angustata* R. Br. Stems erect, 4-12 inches high, simple: sheaths usually longer than the internodes: ligules 1 line long: leaves $\frac{1}{2}$ -3 inches long, 1 line wide or less: panicle 1-2 inches long, contracted, its branches short and erect or appressed: spikelets 2-7-flowered, 3-4 lines long: empty glumes obtuse or rounded at the apex, the first 1-nerved, the second 3-nerved: flowering glume $1\frac{1}{4}$ - $1\frac{1}{2}$ lines long, usually purplish, rounded at the apex. In salt marshes along the coast, Oregon to Alaska, and Labrador to Maine: also Europe and Asia.

P. distans Parl. l. c. 367. *Glyceria distans* Wahl. Stems 1-2 feet high, erect or sometimes decumbent at base, tufted: sheaths often shorter than the internodes, glabrous: ligules $\frac{1}{2}$ -1 line long: leaves 1-6 inches long, 1-2 lines wide, flat or folded, usually stiff and erect, smooth beneath: panicle 2-7 inches long, open, rarely contracted, its branches spreading or ascending, whorled, the lower 1-4 inches sometimes reflexed: spikelets crowded, 3-6 flowered, $1\frac{1}{2}$ - $2\frac{1}{2}$ lines long: empty glumes obtuse or acute, 1-nerved; the second exceeding the first: flowering glumes $\frac{1}{2}$ -1 line long, obtuse, obscurely nerved. Along the coast of Washington, and on the Atlantic coast from Nova Scotia to New Jersey: also in Europe.

P. Lemmonii Scribn. Am. Grasses ii, 276. *Glyceria Lemmonii* Vasey. Densely caespitose, with numerous involute-setaceous radical leaves, pale green and glaucous: stems slender, 4-16 inches high, smooth, simple: sheaths shorter than the internodes, smooth: ligules nearly 1 line long, acute: leaves setaceous, 2-4 inches long, smooth: panicle long-exserted, often purplish, 1-4 inches long, open, its unequal scabrous branches spreading or ascending, the lower 1-2 inches long: spikelets narrow, 7-flowered, 2-3 lines long; first glume less than a line long; the second about twice as long: flowering glumes about a line long, abruptly pointed. In alkaline meadows: eastern Oregon to California and Brit. Columbia.

44 PLEUROPOGON R. Br. App. Parry Voy. 286.

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P. Californicum Benth. Vasey Grasses Pac. Slope, ii, 68. Stems erect, or somewhat decumbent at base, rather weak, 2-4 feet high: sheaths smooth, equalling or exceeding the internodes, the lower ones short and membranous: ligules 2-3 lines long: leaves flat or folded, 3-21 inches long, 1-3 lines wide, obtuse, smooth, or barely rough above: panicle a simple leucod raceme, 6-12 inches long: spikelets linear-oblong, 10-20-flowered, about 1 line long: empty glumes oblong, obliquely obtuse, smooth, 1-nerved below, the first 1-1½ lines long, the second 1 line longer: flowering glumes lance-oblong, erose or dentate at the membranous obtuse apex, scabrous, strongly 7-nerved, 3-4 lines long: awn arising below the apex, 1-5 lines long: palets oblong, obtuse, nearly equalling the glumes. In low meadow sands, southern Oregon to California.

P. refractum Benth. Vasey l. c. 69. Tufted from a strong creeping rootstock: stems rather weak, 2-4 feet high, erect, smooth, simple: sheaths nearly smooth, equalling or slightly exceeding the long internodes: ligules 1-2 lines long, truncate: leaves flat or folded, scabrous above, 2-10 inches long, 2-4 lines wide: panicle a simple secund raceme of 6-10 spikelets pendent on recurved pedicels, 6-12 lines long: spikelets linear-oblong, 8-12-flowered, about 1 inch long: empty glumes lance-oblong, obtuse or emarginate, often denticulate, thin, smooth, 1-nerved, 2-3 lines long, the second slightly longer: flowering glumes lance-oblong, erose or dentate at the truncate membranous summit, nearly smooth, prominently 7-9-nerved, 3½-4 lines long: awn arising at the apex, 2-4 lines long: palet linear, emarginate, shorter than the glumes. Along mountain streams, Oregon and Washington.

45 POA L. Sp. 67.

Annual or perennial grasses with flat or convolute leaves and numerous spikelets in open or contracted panicles. Spikelets 2-6-flowered, compressed, the rachella usually glabrous. Flowers all perfect or rarely dioecious or polygamous. Glumes membranous, keeled, the two lower empty, 1-3-nerved: the flowering glumes longer than the empty ones, generally with a tuft of cobwebby hairs at base, 5-nerved, the marginal nerves usually pubescent. Palets a little shorter than the glumes, 2-nerved or 2-keeled. Stamens 3. Styles short, distinct, with plumose stigmas. Grain free, or sometimes adherent to the palet.

§ 2 MELICOIDES Glumes obtuse or barely acute, the empty ones 1-5-nerved, the flowering ones without cobwebby hairs at base, not prominently keeled.

P. argentea Howell Vasey Bull. Torr. Bot. Club. xv, 11. Stems slender, loosely tufted, 6-8 inches high, erect or somewhat decumbent at base: sheaths loose and membranous, longer than the internodes: ligules acute, 1½-2 lines long: leaves of the sterile shoots numerous, curved,

EXHIBIT

conduplicate, $\frac{3}{4}$ -3 inches long, less than 1 line wide: panicle 1-1 $\frac{1}{2}$ inches long, oblong, loosely-flowered, with a pale silvery hue: spikelets oblong-linear, 3-4 lines long, 3-5-flowered: empty glumes subequal, 2-2 $\frac{1}{2}$ lines long, 3-, 4- or 5-nerved, obovate, with shining scarious margins: flowering glumes nearly 3 lines long, oval or ovate, denticulate, 5-7-nerved: palea lanceolate, about as long as the glumes. On the top of Ashland Butte in the Siskiyou Mountains, Oregon.

P. macrantha Vasey Bull. Torr. Bot. Club. xv, 11. Stems stout, smooth, 15-20 inches high, from stout perennial creeping rootstocks, dicious: sheaths loose, equalling or exceeding the internodes: ligules $\frac{1}{2}$ -1 line long: leaves folded or involute, the lower ones with sterile branches in their axils, 6-10 inches long, blunt or abruptly acute at the apex: panicle 2-5 inches long, sometimes interrupted below, its branches in twos or threes, erect, the longest 1 $\frac{1}{2}$ -2 $\frac{1}{2}$ inches long: staminate spikelets 5-8 lines long, compressed, 4-7-flowered, yellowish: empty glumes oblong-lanceolate, the first, 4-5 lines long, 3-5-nerved, ciliate on the midnerve; second 4-6 lines long, 3-7-nerved: flowering glumes 4-5 lines long, oval or lanceolate, with soft hairs at base and minutely pubescent on the nerves, the apex notched, awnless, 3-10-nerved: palea but very little shorter than its glume, linear, ciliate on the keels; pistillate spikelets rather smaller and more compact. On sand-dunes along the coast of Oregon and Washington.

§ 2 **EUPOA** Glumes usually acute, more or less prominently carinate, with or without cobwebby hairs at the base of the flowering glumes.

P. ANNUA L. Sp. 68. A soft depressed or sometimes erect annual: stems weak, 2-12 inches long: sheaths shorter than the internodes: ligules 1-2 lines long: basal leaves $\frac{1}{4}$ - $\frac{3}{4}$ as long as the stem; those of the stems 3, flat or conduplicate, abruptly acute, the upper $\frac{1}{4}$ -2 inches long: panicle ovoid or pyramidal, subsecund, 1-3 inches long, its branches mostly in pairs, the longest 1-2 inches long, sometimes drooping: spikelets 2-3 lines long, 3-7-flowered, oval or ovate-lanceolate: empty glumes compressed; the first 1-3-nerved, the second 3-nerved, broadest at or above the middle, usually 1-2 lines long: flowering glumes ovate-oval, smooth, erose at the apex, 1-2 lines long, with soft hairs on the keel for half its length and on the lower part of the lateral nerves: palea about 2 $\frac{1}{2}$ lines long, ciliate or pubescent on the keels. Common everywhere: naturalized from Europe.

P. subaristata Scribn. Macoun Cat. Can. Pl. 4, 227, name only. A slender densely tufted perennial 10-20 inches high: leaves of sterile shoots conduplicate, scabrous, 2 $\frac{1}{2}$ -5 inches long: sheaths of the stem 2, smooth, the upper one nearly half as long as the stem: ligules $\frac{1}{2}$ line long: upper leaf pungent, $\frac{1}{2}$ -2 inches long: panicle linear to oval, dense, somewhat interrupted, 1 $\frac{1}{2}$ -3 inches long: spikelets linear-lanceolate, 4-7-flowered, 3-5 lines long; empty glumes subequal, linear-lanceolate, 3 lines long, 1-nerved: flowering glumes linear-lanceolate, 3 lines long, scabrous on the nerves, not webbed: palea 2 $\frac{1}{2}$ lines long, ciliate on the keels. Idaho to Wyoming.

P. Ousleki Vasey Cont. U. S. Nat. Herb. 1, 271. A glabrous, tufted perennial 16-20 inches high: leaves of the stem 2: lower sheaths longer than the internodes: ligules 1-1 $\frac{1}{2}$ lines long: leaves flat or involute, acute, 2-2 $\frac{1}{2}$ inches long, less than 1 line wide: panicle more or less exerted, narrow, 3-5 inches long, the branches mostly in pairs, the longest 1 $\frac{1}{2}$ -2 inches long, bearing 4-8 spikelets on the outer half: spikelets 3-3 $\frac{1}{2}$ lines long, 2-3-flowered: rachella hispidulous: empty glumes with broad char-
ficeo-hyaline margins, first ovate-lanceolate, nearly 2 lines long, 1-nerved, rarely 3-nerved, second oval erosely acute, about 2 lines long, 3-nerved: flowering glumes keeled 2-2 $\frac{1}{2}$ lines long, scabrous, oval, subacute: palea 5 lines long, 2 toothed, ciliate on the keels. In the mountains of eastern

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P. reflexa Vasey & Scribn. Cat. Grasses U. S. 83. A slender perennial 2-5 feet high: ligules 1 line or less long: leaves 2-4 inches long, 1-2 lines wide, nearly smooth, flat, abruptly pointed: panicle open, pyramidal, 2-4 inches long, its branches often reflexed, the longest 2-4 inches long, bearing 2-4 spikelets near the ends: spikelets linear, 4-5 lines long, 2-4 flowered: empty glumes unequal; the first 1-nerved, 1-1½ line long; the second 1½-2 lines long, 3-nerved, oval; flowering glumes slightly pubescent at base, 1½-2 lines long, oval, abruptly pointed: palea nearly as long as the glumes. Idaho to Montana, Colorado and New Mexico.

P. nervosa Vasey Grasses Pac. Slope, ii, 81. A tall often dioecious loosely tufted perennial: stems rather slender, from slender stoloniferous rootstocks, 1½-3 feet high, erect, smooth: leaves of sterile shoots numerous, flat or conduplicate, scabrous above, rather thin, 6-12 inches long, 1-2 lines wide, those of the stem usually 3: sheaths closed, smooth, shorter than the long internodes: ligules obtuse, 1-2 line long: panicle loose, 3-6 inches long, its lower branches scabrous, 2-4 at each of the 6 or 7 nodes, 1-2 inches long, bearing 2-5 spikelets near the extremities: spikelets compressed, 4-5 lines long, 4-7 flowered: empty glumes ovate, acute, carinate, hispid on the keels, 1½-1¾ lines long: flowering glumes lanceolate, barely acute, scarious-margined, scabrous on the nerves or throughout, often villous below but not webbed, 5-nerved, 2-lines long: palea lance-oblong, ciliate on the keels, nearly equalling the glumes. In open places in wooded districts California to Alaska and Montana.

P. Idahoensis Beal Grasses N. Am. ii, 539. A slender tufted erect perennial 20-30 inches high with 2 or 3 distant leaves: leaves of sterile shoots numerous, mostly filiform, 6-10 inches long, flaccid, erect; those of the stem with long sheaths, and erect filiform blades 1-3 inches long; ligules acute, about 1 line long: panicle loose, and flexuous, 3-4 inches long, its scabrous capillary branches in twos or threes or solitary, the longer 1½ inches long, with few spikelets near the extremities: spikelets compressed, 3-5 lines long, rather loosely 4-7-flowered: empty glumes nearly equal, linear-ovate, acute, with broad scarious margins; flowering glume 2½-3 lines long, lance-oblong, subacute, scarious at the apex, minutely scabrous throughout: palea nearly equalling the glume. On rocky slopes, eastern Oregon to Idaho.

P. Sandbergii Vasey Contrib. U. S. Nat. Herb. i, 276. Stems tufted, 10-16 inches high, slender, the lower portion bearing about 2 sheaths with very short blades: ligules about 1 line long: panicle 1½-3 inches long, sometimes very narrow, the branches ascending, nearly smooth, the lower in twos or threes, unequal, the longer 1-2 inches long: spikelets 2-4-flowered, about 3 lines long, purplish: empty glumes lanceolate, subacute: flowering glumes linear-oblong, obtuse, nearly 2 lines long, sparingly pubescent or puberulent, somewhat villous near the base but not webbed, scarious at the apex: palea equalling the glumes. On grassy slopes, Clearwater Valley, Idaho.

P. incurva Scribn. & Williams U. S. Dept. Agr. Div. Agrost. Cir. 9, 6. Stems slender, closely caespitose, 6-10 inches high, flexuous, smooth: sheaths smooth, shorter than the internode: ligules acute, often irregularly fimbriate: leaves rather rigid, flexuously recurved, convolute, smooth below, minutely hispidulous above and at the acute apex, 1-2½ inches long, those of the radical shoots much the longest: panicle few-flowered, purplish, its branches mostly solitary: spikelets compressed, loosely 2-3-flowered, about 2½ lines long: empty glumes unequal, the lower oblong-lanceolate, subacute, indistinctly 3-nerved, about 1 line long, the upper broadly ovate, distinctly 3-nerved, usually 1½ lines long, flowering glumes rounded on the back: densely pubescent below rather broadly scarious-

margined above, about 2 lines long: palet nearly or quite equalling the glume. Olympic Mountains Washington at about 6000 feet elevation.

P. occidentalis Vasey & Scribn. Cont. U. S. Nat. Herb. 1, 274. A loosely tufted, perennial: stems slender, 2-3 feet high, rather weak; more or less scabrous: sheath shorter than the internodes: ligules ovate, $1\frac{1}{4}$ -2 lines long, leaves of the stems 3-6, flat, 2-7 inches long, 1-3 lines wide: panicle 4-10 inches long, its filiform branches in pairs or threes, or solitary below, the longest 2-6 inches long, bearing 2-6 spikelets near the extremities: spikelets ovate or ovate-lanceolate, 3-4 lines long, usually 4-flowered: first empty glume lanceolate, 1-nerved, $1\frac{1}{4}$ lines long, acuminate; second ovate-lanceolate, $2\frac{1}{4}$ lines long; flowering glumes oblong-lanceolate, $2\frac{1}{4}$ -3 lines long, acute, very thinly pubescent on the marginal nerves and the lower half of the keel: palets nearly as long as the glume. In moist woods, northern Oregon to Alaska.

P. Kelloggii Vasey Grasses Pac. Slope, ii, 79. Stems tufted, from stoloniferous rootstocks, slender, 2-3 feet high: leaves from the base numerous with short scarious sheaths, and flat or loosely involute blades 6-12 inches long: leaves of the stem usually 3: sheaths nearly smooth, nearly equalling or exceeding the internodes, the upper one extending nearly to the panicle: ligules 1 line long, or less: panicle pyramidal, open, its scarious branches divergent or horizontal, 1-3 inches long: spikelets oblong, compressed, 3 lines long, loosely 2-3-flowered: empty glumes ovate, acute, hispid on the keel, the first 1-nerved, $1\frac{1}{4}$ lines long; the second $\frac{1}{4}$ line longer and 3-nerved; flowering glumes lance-ovate, acute, smooth except the long thin web at the base, 5-nerved nearly to the apex, the midnerve barely excurrent, about 2 lines long: palet linear-oblong, 2-toothed, nearly smooth on the green keels, $\frac{1}{4}$ line shorter than the glumes. Eastern Oregon to California.

P. Bolanderi Vasey Bot. Gaz. vii, 32. A loosely tufted perennial: stems erect, or slightly geniculate below, somewhat thickened at the base, smooth: basal leaves thin and lax, smooth, 3-6 inches long, of the stems 3-4: sheaths smooth, closed at the throat, shorter than the internodes: ligules obtuse, $1\frac{1}{2}$ -2 lines long: stem leaves 2-4 inches long, about 2 lines wide, flat, rather abruptly pointed, thin and smooth: panicle erect, slender, 4-6 inches long, its branches smooth, 2-4 at each of the 4 or 5 distant nodes, erect or at length spreading: spikelets 1-3-flowered, $1\frac{1}{2}$ -2 lines long: empty glumes ovate, nearly acute, smooth, the first 1-nerved, 1 line long, the second obscurely 3-nerved and longer: flowering glumes ovate-oblong, obtuse or barely acute, scarious-margined, nearly smooth except the slight web at the base, 5-nerved, $1\frac{1}{4}$ lines long: palet oblong, obtuse, green, nearly smooth, slightly shorter than the glume. In moist places in the Coast Mountains, Oregon to California.

P. Howellii Vasey & Scribn. Cat. Grasses U. S. 82. A densely tufted pale green perennial with fibrous roots: stems erect, nearly smooth, 1-2 feet high: sheaths nearly smooth, half open above, shorter than the internodes: ligules 2-3 lines long, obtuse and lacerate at the apex: basal leaves numerous, flat, thin, 3-6 inches long, 1-2 lines wide; of the stem 2 or 3, flat, or involute near the attenuate points, 2-4 inches long: panicle rather loose and open, 5-8 inches long, its branches 2-5 at each of the 5 or 6 nodes, erect until near maturity, the longer 2-3 inches long: spikelets 2-3 lines long, loosely 2-5-flowered: empty glumes ovate, acute, thin, green, sparingly hispid on the keels, $1-1\frac{1}{4}$ lines long: flowering glumes ovate, acute, green except the narrow membranous margins, pubescent throughout, 5-nerved, $1\frac{1}{4}$ lines long: web at base thin, about as long as the glume: palet oblong, emarginate, nearly smooth, on the green keels, slightly shorter than the glume. In dry open places in forests, western Oregon to Cal.

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feet high, smooth or slightly scabrous, from stout creeping perennial rootstocks: sheaths smooth, the lower ones short but exceeding the internodes: ligules obtuse, 1 line long or less, or often nearly obsolete: panicle oblong, 1-3 inches long: leaves flat or involute, 2-6 inches long, 1-2 lines wide: panicle 1-3 inches long, its branches hispid, 2-4 at each of the 5-7 nodes, 1 inch long or less, nearly erect or somewhat spreading: spikelets rather turgid 3-5-flowered: empty glumes ovate, acute or acutish, smooth, $1\frac{1}{2}$ -2 lines long: flowering glumes lance-ovate, minutely scabrous, hispid-ciliate on the keel, purple with scarious tips, 5-nerved, $2\frac{1}{2}$ -3 lines long: palea oblong, obtuse or retuse, 2 lines long, ciliate on the keels. On the highest peaks of the Cascade Mountains, Washington to California.

P. pratensis L. Sp. 67. Stems slender, erect, simple, 1-4 feet high, from long running rootstocks: sheaths often longer than the internodes: ligules truncate, $\frac{1}{2}$ line long, or less: leaves 2-10 inches long, flat or involute $1\frac{1}{2}$ -3 lines wide: panicle 2-8 inches long, usually pyramidal, its branches spreading or ascending, 1-3 inches long: spikelets 3-5-flowered, 2-2 $\frac{1}{2}$ lines long: empty glumes unequal, glabrous, rough on the keel, the lower 1-nerved, the upper 3-nerved: flowering glume $1\frac{1}{2}$ line long, acute, 5-nerved, webbed at the base, the marginal nerves and midnerve silky-pubescent below. Common everywhere.

P. compressa L. Sp. 69. Pale bluish-green and glabrous: stems 6-24 inches long, decumbent at base, from long horizontal rootstocks, smooth, much flattened: sheaths loose, mostly shorter than the internodes: ligules $\frac{1}{2}$ line long: leaves 1-4 inches long, about 1 line wide, smooth, beneath, rough above: panicle usually contracted, its branches erect or ascending, 1 inch long or less: spikelets 3-9-flowered, $1\frac{1}{2}$ -3 lines long: empty glumes acute, 3-nerved: flowering glumes 1-1 $\frac{1}{4}$ lines long, obscurely 3-nerved, the nerves slightly pubescent toward the base. In fields and waste places: naturalized from Europe.

P. Wheeleri Vasey Rothr. Rep. Bot. U. S. Surv. vi, 291. Stems 10-30 inches high, from perennial running rootstocks: ligules about 1 line long: leaves of sterile shoot: 7-10 inches long, 1-2 lines wide, rigid, conduplicate or involute, with a firm oblique point: panicle open, 4-6 inches long, ovoid, its slender branches mostly in pairs, the longer about 2 inches long, spikelets lance-elliptical, 2-4 lines long, 3-flowered: empty glumes subequal, ovate-lanceolate 3-nerved: the second one 2 lines long: flowering glumes not webbed, 2 lines long, ciliate on the lateral nerves and on the lower part of the keel, oval, subacute, with scarious margins: palea truncate very nearly as long as the glumes, ciliate on the keel. Eastern Washington to Colorado.

P. acutiglumis Scribn. U. S. Dept. Agr. Div. Agrost. Cir. 9, 4. A loosely tufted perennial: stems smooth or somewhat roughened at the nodes, about 2 feet high, sheaths shorter than the internodes: ligules about 2 lines long, often more or less fimbriately divided: stem leaves 2-3, minutely roughened on both sides: panicle ovate in outline, about 4 inches long, its branches in twos or threes, rough-hispid, ascending, the lower ones 1-2 $\frac{1}{2}$ inches long: spikelets lanceolate, acute, 5-7 lines long loosely 4-7-flowered: empty glumes unequal, hispid on the back, the lower long-acuminate, 3-nerved, the upper lanceolate, acute, more or less distinctly 5-nerved, 2 lines long: flowering glumes narrowly oblong-lanceolate, acute, 5-nerved, hispid on the back: palea oblong-linear, acute, a little shorter than the glumes, ciliate on the keels. Near Grave Creek, southern Oregon.

P. epilis Scribn. l. c. A closely caespitose perennial with numerous basal leaves from intravaginal shoots: stems slender, smooth, sheaths mostly shorter than the internodes: ligules of the stems leaves acute, $1\frac{1}{2}$ line long: leaves smooth, flat or convolute, 2-10 inches long, panicle contracted, its smooth branches erect or ascending, 1-2 inches long: spikelets ovate-

lanceolate 3-4 flowered, about 4 lines long: empty glumes smooth, unequal, the lower lanceolate or broader, acute or acuminate, 1-nerved, 1 line long; the upper broadly ovate, acute, 3-nerved, about $1\frac{1}{2}$ lines long: flowering glumes 5-nerved, rough-hispid on the back, oblong-elliptical, obtuse, about 2 lines long: palea a little shorter than the glumes, ciliate on the keels, the apex bidentate. In open places in timberland, eastern Washington to Colorado.

P. confinis Vasey Grasses Pac. Slope, II, 65. A caespitose imperfectly diocious perennial, with long running rootstocks: stems erect, slender, 4-12 inches high, smooth: sheaths shorter than the internodes, open above: ligules a line long to obsolete: leaves of sterile, shoots numerous with smooth scarious-margined sheaths and involute blades 2-6 inches long, about $\frac{1}{2}$ line wide: panicle oblong, 1-2 inches long its scabrous; branches in threes, twos or solitary, 1 inch long or less: spikelets slightly compressed, 2-3 lines long, 3-6 flowered: empty glumes broadly ovate, acute, 1-nerved, nearly smooth, 1- $1\frac{1}{2}$ lines long, the second slightly longer but neither equalling the first floret: flowering glumes broadly ovate, acute, not webbed, 3-nerved, about $1\frac{1}{2}$ lines long: palea ovate-oblong pubescent on the keels: staminate flowers with abortive ovaries, and pistillate flowers with imperfect stamens. On sandy ground along the coast, Oregon to Alaska.

P. flava L. Sp. 68. *P. serotina* Ehrh. Stems slender, simple or rarely branched, smooth, $1\frac{1}{2}$ -5 feet long: sheaths usually shorter than the internodes, smooth: ligules 1-2 lines long: leaves 2-6 inches long, 1-2 lines wide, smooth or rough: panicle 6-14 inches long, open, the branches spreading or ascending, 2-5 inches long: spikelets 3-5 flowered, $1\frac{1}{2}$ -2 lines long: empty glumes rough above on the keels, the lower usually 1-nerved; the upper three-nerved: flowering glumes obtuse, somewhat webbed at base, 1- $1\frac{1}{2}$ lines long, silky-pubescent on the lower half of the marginal nerves and the midnerve. In moist meadows, Oregon to Brit. Columbia and Illinois: also Europe and Asia.

P. nemoralis L. Sp. 69. Stems slender, 6-24 inches high, erect, simple smooth: sheaths usually shorter than the internodes: ligules $\frac{1}{2}$ -1 line long, truncate: leaves 1-4 inches long, 1 line wide or less, smooth or rough: panicle 2-5 inches long, open, its branches erect or ascending 1-2 inches long: spikelets 2-5 flowered $1\frac{1}{2}$ -2 $\frac{1}{2}$ inches long: empty glumes acute; or acuminate, 1-3-nerved: flowering glumes obtuse or acute, 1- $1\frac{1}{2}$ lines long, faintly 5-nerved, somewhat webbed at the base, the middle and marginal nerves silky on the lower half. Eastern Washington to the Eastern States.

P. glauca Vahl Fl. Dan. t. 964. Stems erect, 6-24 inches high, rigid, glabrous and somewhat glaucous: sheaths longer than the internodes: ligules 1 line long: leaves 1-2 inches long, 1 line wide or less, smooth beneath, scabrous above: panicle 1-4 inches long, open, with erect, or ascending branches 6-18 lines long: spikelets 2-4 flowered, $2\frac{1}{2}$ -3 lines long: empty glumes acute, 3-nerved, glabrous, rough on the upper part of the keel: flowering glumes $1\frac{1}{2}$ - $1\frac{3}{4}$ lines long, obtuse or acutish, rough, not webbed at the base, the lower part of the midnerve and marginal nerves silky-pubescent. Oregon to the Rocky mountains and Maine: also in Europe.

P. laxa Hænke Sudet. 118. Stems 6-12 inches high, erect: sheaths often longer than the internodes: ligules about 1 line long: leaves 1-3 inches long, $\frac{1}{2}$ -1 line wide, acuminate: panicle 1-4 inches long, its branches usually erect, sometimes ascending, 1 inch long or less: spikelets 3-5 flowered, 2-2 $\frac{1}{2}$ lines long: empty glumes usually 3-nerved acute, glabrous, rough on the keel at the apex: flowering glumes $1\frac{1}{2}$ - $1\frac{3}{4}$ lines long, obtuse, 3-nerved, or sometimes with an additional pair of obscure nerves, the midnerve pilose on the lower half, rough above; the lateral ones pilose below. Washington to Alaska and across the continent: also in Europe.

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P. gracillima Vasey Contrib. U. S. Nat. Herb. i, 272. A densely tufted perennial: stems slender, 15-25 inches high, erect, smooth: sheaths shorter than the internodes, smooth: ligules about 2 lines long, lanceolate, acute: leaves of sterile shoots thin, smooth, acute, flat or conduplicate, filiform, 2-5 inches long, $\frac{1}{4}$ - $\frac{1}{2}$ line wide, those of the stem 2, the upper with very long sheath and short blade: panicle open, pyramidal or ovoid, 2-4 inches long, its scabrous branches in twos to fives, the longest 2-2 $\frac{1}{2}$ inches long, bearing 2-4 spikelets on the outer third: spikelets oval or ovate-lanceolate, 3-5-flowered, 4-6 lines long: empty glumes lanceolate, acute, 3-nerved, the first 2-2 $\frac{1}{2}$ lines long: the second a little longer: flowering glumes elliptical, 2-3 lines long, subacute or obtuse usually purplish with a wide scarious tip, scabrous, pubescent on the nerves below: palea linear, as long as the glumes. On cliffs along streams, Oregon and Washington.

P. saxatilis Scribn. & Williams U. S. Dept. Agr. Div. Agron. Cir. 9. A closely caespitose perennial: Stems erect, very smooth, 10-18 inches high: sheaths smooth, or the lower ones sparsely pubescent, shorter than the internodes: ligules 1-2 lines long: leaves flat, soft, smooth, 1-2 inches long: panicle lax, 2-4 inches long, its filiform branches ascending, the lower ones about 2 inches long: spikelets compressed, lanceolate, 4-5 lines long, 3-5-flowered: empty glumes somewhat unequal obtuse or subacute, 3-nerved, smooth, about 2 lines long: flowering glumes obscurely 5-nerved, minutely scabrous on the back with broad scarious erose-dentate margins, 2-3 lines long: palea nearly equalling the glumes, ciliate on the keels, bidentate at the apex. Dry rocky places on Mount Rainier, Washington.

P. invaginata Scribn. & Williams l. c. 6. A smooth caespitose perennial with numerous intravaginal shoots and marcescent sheaths: sheaths smooth: ligules acute, 2-2 $\frac{1}{2}$ lines long: leaves mostly flat, rather narrow, smooth or the margins minutely hispidulous near the base: panicle subpyramidal to oblong, its filiform scabrous branches mostly in threes or fives: spikelets compressed, lanceolate, rather loosely 2-5-flowered, 2 $\frac{1}{2}$ -4 lines long: empty glumes 3-nerved, narrowly oblong to oblong-ovate, obtuse to subacute, the lower $1\frac{1}{2}$ -2 lines long, the upper a little longer: flowering glumes keeled, oblong-ovate, 5-nerved, minutely scabrous above, pubescent below on the nerves, 2-3 lines long: palea shorter than the glumes, ciliate on the keels. On bluffs along the Columbia river near Hood River Oregon to California.

§ 3 *ATROPIS* Rupr. Fl. Samoj. 64: as Genus. Empty glumes much shorter than the florets: flowering glumes chartaceous, rarely herbaceous, convex on the back; the midnerve often reaching the denticulate apex, or extending as a mucro; the lateral nerves all vanishing at some distance below the broad scarious apex.

P. Saksdorfii Vasey Beal Grasses N. Am. ii, 574, under *Atropis*. A densely tufted light green perennial: stems 5-7 inches high: ligules truncate, about 1 line long: leaves of sterile shoots rigid, recurved, conduplicate, pungent pointed, 2-4 inches long, those of the stem erect and shorter: panicle narrow, simple, spike-like, 1-4 inches long: spikelets linear-lanceolate, 1-3-flowered, 2-3 lines long: empty glumes linear-lanceolate; the first 3-nerved 2-2 $\frac{1}{2}$ lines long; the second a little longer: flowering glumes chartaceous, ovate, 2-2 $\frac{1}{2}$ lines long: palea ciliate on the keels. On gravelly banks near glaciers, Washington.

P. Vaseyochloa Scribn. U. S. Dept. Agr. Div. Agron. Cir. 9, 1. *P. pulchella* Vasey. Stems densely tufted, 5-10 inches high: erect or ascending from the base, smooth: leaves of the sterile shoots numerous, conduplicate, abruptly pointed, 1-2 inches long, less than 1 line wide: those of the stem 1 or 2, 6-12 lines long: panicle ovoid or pyramidal, 1-2 inches long, its branches

mostly in pairs, smooth, each bearing a single spikelet: purplish, oval or linear 3-5-flowered, 3-5 lines long: empty glumes obtuse or acute, often erose-denticulate, broadly scarious-margined; the first ovate-lanceolate, 1-nerved; the second oval-lanceolate, 3-nerved, 2 lines long: flowering glumes ovate-lanceolate, 3-5-nerved, not pubescent nor webbed at base: palea curved, linear, 2½ lines long 2-toothed, scabrous on the keels. On the plains of eastern Oregon and Wash.

P. Fendleriana Vasey Grasses Pac. Slope II, 74. A densely tufted completely dioecious perennial: stems erect, scabrous to nearly smooth, 1-3 feet high: sheaths rather loose, scabrous above, shorter than the internodes: ligules 1-2 lines long: leaves of sterile shoots very numerous, conduplicate, 6-12 lines long, about 1 line wide: panicle 2-4 inches long, oblong, its minutely scabrous branches in twos or threes, erect or somewhat spreading, 1-2 inches long: spikelets compressed 3-4 lines long, 3-5-flowered: empty glumes broadly ovate, acute, carinate, minutely scabrous, 1-nerved, 1-2 lines long the first slightly smaller: flowering glumes ovate-oblong, erose or emarginate at the obtuse apex, carinate, hispid on the keel above and more or less pubescent on the marginal nerves and midnerve below, 2-3 lines long: palea oblong, emarginate, pubescent on the keels. On dry hills, eastern Washington to California and the Rocky Mountains.

P. lucida Vasey Cont. U. S. Nat. Herb. I, 274. A slender tufted perennial: stems 18-24 inches high, smooth: sheaths equalling or shorter than the internodes, smooth: ligules 2 lines long: radical leaves 5-7 inches long 1-2 lines wide; those of the stem about 3, 2-3 inches long: panicle 4-6 inches long, narrow, its branches mostly in twos or threes, the lower ones 1-2 inches long, erect or appressed: spikelets 3-4 lines long 3-4-flowered, shining, pale green: empty glumes oblong, abruptly acute, unequal, 1½-2 lines long, smooth, scarious at the apex and margins: flowering glumes 2 lines long, linear-oblong, obtuse, sparsely and minutely scabrous, slightly pubescent near the base of the keel and lateral nerves, scarious at the apex, 5-nerved: palea nearly equalling its glume. On high hills, eastern Wash. to Colo.

P. Leckenbyi Scribn. l. c. 2. A pale green tufted perennial: stems 2-2½ feet high, smooth, often rooting at the lower nodes: sheaths smooth, all but the uppermost exceeding the internodes, the lower ones membranous, inflated: ligules about 8 lines long, acute, often fimbriately divided: radical leaves long and slender, glaucous, green, smooth beneath, rough above and on the margins, acute, flat: panicle 5-7 inches long; its branches erect, the longer ones 2-3 inches long: spikelets oblong-lanceolate, 6-7 lines long, 5-8-flowered, compressed: empty glumes subequal 3-nerved, rough-hispid on the nerves rather narrowly lanceolate, acute or acuminate 4 lines long: flowering glumes ovate-oblong, 5-nerved, 3-5 lines long, scarious-margined, often erose dentate above, hispidulous on the upper and pubescent on the lower half: palea shorter than the glumes, conspicuous, ciliate on the keels and minutely pubescent below, narrowed above to an erose ciliate apex. Dry and very sandy soil eastern Washington.

P. Nevadensis Vasey Scribn. Bull. Torr. Bot. Club x, 66. A loosely tufted perennial: stems rather stout, 20-40 inches high, scabrous below the panicle: ligules shorter than the internodes: ligules about 2 lines long, scabrous: leaves of sterile shoots very narrow, flat or conduplicate, 6-12 inches long, scabrous, those of the stems usually 3, with sheaths 4-8 inches long and blades 1-4 inches long: panicle narrow rather densely flowered, 4-5 inches long, its branches 2 or more at each joint, erect: spikelets 3-5 lines long, 3-8-flowered: empty glumes 1½-2 lines long, nearly equal obtuse or subacute, 3-nerved, scabrous: flowering glumes 2 lines long, oblong, obtuse, scarious-margined above with a few very short hairs at base: palea ciliate on the keels. Moist soil, Oregon to Nevada Brit. Colum-

bia and North Dakota.

P. laevigata Scribn. *P. laevis* Vasey, not Barb. Stems tufted, pale, slender, erect, smooth, 2-3 feet high, with 2 or 3 distant leaves; sheaths smooth; ligules acute; leaves of sterile shoots narrow, 5-8 inches long, those of the stem shorter; panicle narrow, rather loose 4-8 inches long, sometimes interrupted below, its branches erect or appressed the lower in twos or threes, unequal, the longest 1-2 inches long; spikelets linear, 3-5 lines long, about 5-flowered; empty glumes nearly equal, linear-lanceolate, acute, thin, pale and scarious except on the minutely scabrous midrib; flowering glumes 2-2½ lines long, linear-oblong, subacute, 5-nerved, minutely scabrous, slightly pubescent on the keel and marginal nerves near the base, the apex scabrous and yellowish-tinged in age, somewhat erose; palea equalling the glumes, scabrous on the keels. Eastern Washington to Brit. Columbia, Montana and Arizona.

P. longiligula Scribn. U. S. Dept. Agr. Div. Agrost. Cir. 9, 3. A caespitose glaucous perennial: stems rather stiff, 16-20 inches high; basal sheaths persistent and rather crowded; ligules conspicuous, 2-5 lines long; leaves of sterile shoots erect or spreading, usually 6-10 inches long, flat or conduplicate, with conspicuous decurrent ligules; cauline leaves shorter, the upper ones sometimes reduced to a mere mucro, all rather rigid and mucronate-pointed; panicle ovate in outline, 3-5 inches long, its lower branches 1-2 inches long; spikelets compressed, ovate-lanceolate, rather acute, 4-6-flowered, 3-6 lines long; empty glumes unequal, more or less rough-hispid on the back, the lower lanceolate, acute or acuminate, 1-nerved, 3 lines long; the upper much broader, 3-nerved; flowering glumes ovate-oblong, obtuse, 5-nerved, more or less scabrous above, woolly-pubescent on the lower half of the keel and marginal nerves, with broad hyaline margins, 2½-3 lines long; palea much shorter than the glumes, hyaline with green hispid-pubescent keels. Oregon to South Dakota and Arizona.

P. Lettermanii Vasey Contrib. Nat. Herb. 1, 273. A dwarf densely tufted perennial: stems 2-4 inches high; sheaths loose, longer than the internodes; ligules rather conspicuous, acute; radical leaves flat, 1-2 inches long, ½-1 line wide; those of the stem 1 or 2, about 1 inch long; panicle 6-12 lines long, oblong, rather dense, its branches mostly in twos, short, erect, with 1-3 spikelets at the extremities; spikelets 1½-2 lines long, 2-4-flowered, purplish; empty glumes nearly as long as the spikelets, oblong-lanceolate, acute, nearly equal, smooth; flowering glumes 1-1½ lines long ovate-oblong, acute, or subobtuse, obscurely nerved, smooth, scarious at the apex; palea nearly equalling the glume, acutely 2-toothed at the apex. On Mount Rainier Washington at 9000 feet altitude, and Gray's peak Col.

P. Pringlei Scribn. Bull. Torr. Bot. Club 2, 31. Stems tufted, 5-10 inches high, slender, wiry, with 1 or 2 leaves; ligules conspicuous, 2 lines long; leaves mostly basal, 1-2 inches long, convolute, rigid, those of the stem with very short or nearly obsolete blades; panicle 6-12 lines long, compact, oblong, the few branches mostly in pairs, erect, with 1-2 spikelets each; spikelets 3 lines long, mostly 2-flowered, oblong, turgid, purplish; empty glumes thin, membranous, ovate-lanceolate nearly as long as the florets; flowering glumes about 3 lines long, oblong-lanceolate, subulate, scarious at the apex, smooth, obscurely 5-nerved,; palea a little shorter, acutely 2-toothed. On the high mountains, California to Washington.

P. Leibergii Scribn. U. S. Dept. Agr. Div. Agrost. Bull. 8, 6, t. 11. A densely caespitose fibrous-rooted glabrous perennial: stems slender, 2-6 inches high, the base clothed with loose scarious sheaths; ligules hyaline, about 1 line long; radical leaves numerous, 1-2 inches long, about ½ line wide, those of the stem 6-12 lines long, conduplicate when dry, minutely scabrous along the margins and at the apex, otherwise smooth; panicle simple, of 1-7 spikelets, its lower branches usually in pairs, each branch

bearing a single spikelet: spikelets 2-3-flowered, 3-4 lines long, rather broadly ovate: empty glumes somewhat unequal, the first broadly lanceolate, 1-nerved, subacute, the second much broader than the first, 3-nerved, from subacute to broadly truncate at the erose-dentate apex: flowering glumes glabrous, 2-3 lines long, distinctly 5-nerved, obtuse and erose-dentate at the scarious apex: palea a little shorter than the glumes. On the summits of high ridges. Malheur county Oregon.

P. Fackleyana Nash Bull. Torr. Bot. Club. *P. tenuifolia* Buckley. A slender tufted perennial: stems erect, 12-20 inches high, usually glabrous and tinged with brown or pink: sheaths smooth, the lower longer than the internodes: ligules 1-2 lines long, acute or acuminate, radical leaves numerous, flat or conduplicate, 2-6 inches long, less than 1 line wide, often abruptly acute at the apex, those of the stem 2, 1-2 inches long: panicle erect, narrow, 1-3 inches long, its filiform branches in twos or threes, 3-12 lines long, erect or somewhat spreading: spikelets rather firm 3-5 lines long, mostly 3-flowered, pubescent, elliptical-lanceolate: empty glumes obtusely keeled, 3-nerved near the base, the first linear-lanceolate, about $1\frac{1}{2}$ lines long, second elliptical-lanceolate, about 2 lines long: flowering glumes 2-2 $\frac{1}{2}$ lines long, elliptical or linear-oblong, acute to obtuse entire or erose, pubescent on the lower third, puberulent above: palea linear, 2-toothed, 2 lines long. Common on dry plains, eastern Oregon to Brit. Columbia.

Var. stenophylla Vasey, Beal grasses N. Am. ii, 580, under *Atropis*. Stems stouter: panicle open in flower: spikelets 4-6-flowered: glumes slightly larger. On dry hillsides near Roseburg Oregon.

P. Canbyi *Glyceria Canbyi* Scribn. An erect smooth stout perennial: stems simple 3 $\frac{1}{2}$ -4 feet high: sheaths shorter than the internodes: ligules broad, obtuse, 3-4 lines long: leaves of the stem 3-4, flat below, conduplicate above, 7 inches long, 3-5 lines wide: panicle linear or lanceolate, usually interrupted below, about 7 inches long, its branches in half-whorls, erect or ascending, densely flowered, the longer 2-4 inches long: spikelets 3-5-flowered: empty glumes oval, acute or obtuse, almost keeled, 3-nerved, the first $1\frac{1}{2}$ -2 lines long, second 2-3 lines long: flowering glumes oval, scarious 2-2 $\frac{1}{2}$ lines long, 5-nerved, often irregularly toothed at the acute apex: palea 2 lines long, narrow, 2-toothed at the apex. In the Cascade Mountains of Washington.

46 ERAGROSTIS Beauv. Agrost. 70, t. 14, fig. 11. (1812)

Annual or perennial grasses with flat leaves and contracted panicles. Spikelets two- to several-flowered, more or less flattened. Two lower glumes empty, unequal, shorter than the flowering ones, keeled, one-nerved, or the second one three-nerved: Flowering glumes membranous, keeled, three-nerved. Palea shorter than the glumes prominently two-nerved or two-keeled, usually persistent on the rachella. Stamens 2 or 3. Styles distinct, short, with plumose stigmas. Grain free, loosely enclosed in the glume and palea.

E. reptans Nees Agrost. Bras. 514. A glabrous annual: stems 1-18 inches long, creeping, often forming mats 2-20 inches in diameter and 1-6 inches high, branching, the branches erect or ascending: sheaths shorter than or equalling the internodes, villous at the summit: ligules a ring of short hairs: leaves 1-2 inches long, $\frac{1}{2}$ -1 line wide, flat, smooth beneath, rough above: spikelets dioecious, 10-35-flowered, 2-3 lines long: empty glumes unequal, the first $\frac{1}{2}$ - $\frac{3}{4}$ as long as the second: flowering glumes about $1\frac{1}{2}$ lines long, broadly ovate, acute: palea shorter than the glumes, ciliate on the keels. In wet places Oregon to the Eastern States.

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E. Intescens Scribn. U. S. Dept. Agr. Div. Agrost. Cir. 9, 7. A low much branched and densely caespitose annual, 4-8 inches high: sheaths loose, smooth or with a few short hairs at the throat: ligules very short, ciliate: leaves flat, 1-3 inches long, 1-2 lines wide, minutely scabrous above, very acute: panicle pale green or straw-color, 2-4 inches long, its branches ascending to appressed, spikelets narrowly oblong, 3-12-flowered: empty glumes unequal, the first about $\frac{1}{2}$ line long, the second $\frac{1}{2}$ longer; flowering glumes about 1 line long, obtuse, 3-nerved. On sandy banks along Snake river eastern Washington to Idaho.

47 BRIZA L. Sp. 70.

Annual or perennial grasses with flat or convolute leaves, and open or rarely contracted panicles. Spikelets flattened, several-flowered, nodding: flowers perfect, glumes thin, membranous, strongly concave, the two lower empty, 3-5 nerved, flowering glumes imbracted, broader than the empty ones, 5-many-nerved, the uppermost glumes often empty. Palets much shorter than the glumes, hyaline, 2-keeled or 2-nerved. Stamens 3. Styles distinct, with plumous stigmas. Grain usually free, enclosed in the glume and palet.

B. MINOR L. Sp. 70. Stems slender, 4-15 inches high, from an annual root, simple: sheaths shorter than the internodes: ligules 1-3 lines long, acute: leaves 1-5, 1-4 lines wide, sometimes scabrous: panicles 2-5 inches long, open, its capillary branches spreading or ascending, 1-3 inches long: spikelets 3-9-flowered, 1-1 $\frac{1}{2}$ lines long, about 2 lines broad, truncate at the base: glumes scarious-margined, the empty ones about 1 line long: flowering glumes much broader and deeply saccate, about $\frac{1}{2}$ line long. Common in southwestern Oregon to California: naturalized from Europe.

48 FESTUCA L. Sp. 73.

Annual or perennial grasses with flat or convolute leaves and paniculate inflorescence. Spikelets two- to several-flowered, the two lower glumes empty, more or less unequal, acute, keeled: flowering glumes membranaceous, narrow, rounded on the back, 5-nerved, usually acute, and generally awned at the apex. Palets scarcely shorter than the glumes. Stamens 1-3. Styles very short, distinct, with plumose, stigmas. Grain glabrous, elongated, often adherent to the glume or palet.

F. microstachya Nutt. Journ. Acad. Phila. n. s. 1, 187. Stems slender, erect, 6-20 inches high, from an annual root: sheaths shorter, than the internodes, smooth or pubescent: ligules very short: leaves 2-4, erect, slender, 1-4 inches long: panicle erect, racemose or spicate, 2-5 inches long, its branches channelled, single or some of the lowest in pairs, erect, spreading or deflexed, the longest 6-18 lines long: spikelets 1-5-flowered: empty glumes involute, the first 2-3 lines long, second 3-5 lines long: flowering glumes convex, involute, acuminate, scabrous: 2 $\frac{1}{2}$ -4 lines long: palets scabrous, bearing 2 short awns: stamens 1: very variable. On dry open ridges, Arizona to Brit. Columbia.

Var. ciliata Gray, Beal Grasses N. Am. ii, 587. Axis, branches of panicle and glumes all strongly ciliate. On dry ridges, southern Oregon to California.

Var. pauciflora Scribn. Vasey, Cat. Grasses U. S. 90. Stems slender, 1-2 feet high: panicle loose, with longer branches: spikelets 1-2-flowered, the flowering glumes with awns 6-12 lines long. On dry open

places near Portland Oregon.

F. Myurus L. Sp. 74. A soft rather pale green annual: stems slender, smooth, erect, or geniculate at base, 1-3½ feet high: sheaths smooth, longer than the internodes: ligules very short: leaves 3-5, erect, slender 3-6 inches long: panicle narrow, more or less secund, 2-15 inches long its scabrous triquetrous branches in twos and threes below, appressed, the longest racemose, 1-6 inches long: spikelets on stout pedicels, linear, 5-8-flowered 5-6 lines long; the first glume 1 line long or less; the second involute, lanceolate 2-3 lines long: flowering glumes scabrous, involute, acuminate, 2-3 lines long, exclusive of the awns which are 4-10 lines long: palea lanceolate, scabrous on the keels, bearing 2 short awns: stamens one. Common in fields; naturalized from Europe.

F. octoflora Walt. Fl. Car. 71. *F. tenella* Willd. An erect slender tufted annual or biennial: stems sparingly branched 1-2 feet high: sheaths shorter than the internodes, sometimes pubescent: ligules about ½ line long: leaves erect, slender, 1-4 inches long, panicle simple, erect, 2-5 inches long, narrow, or spreading at the base; its branches in pairs or solitary, the longest 1-3 inches long: spikelets flat, oval 2-6 lines long, 7-13-flowered: empty glumes involute so as to appear subulate, the first 1¼ lines long, the second about 2 lines long: flowering glumes involute, acuminate, scabrous, 1½-2 lines long, with an awn ½-3 lines long: palea a little shorter than the glumes: stamens 2. On dry barren ground, Oregon to California and the New England States.

F. confinis Vasey Bull. Torr. Bot. Club xi, 126. A tufted stout light green perennial: stems erect, 2-4 feet high: sheaths loose, shorter than the internodes: ligules truncate, ¼-3 lines long: leaves of sterile shoots half as long as the stem, with long slender points, those of the stem 2-3, 5-8 inches long, 2-3 lines wide, flat or involute, smooth or scabrous: panicle narrow, 4-6 inches long, its branches in twos or threes, erect, the longer 1-2 inches long: spikelets oblong or ovate-lanceolate, 3-9 lines long, 2-3 flowered: empty glumes chartaceous, the first ovate, 1½-3 lines long, 1-nerved the second linear-lanceolate, 3-3½ lines long, 3-nerved: flowering glumes 2½-3 lines long, lanceolate, scabrous, rather firm, acute or acuminate, nearly awnless: palea elliptical, scabrous, ciliate on the keels. South-eastern Oregon to Utah and Wyoming.

F. denticulata Beal Grasses N. Am. ii, 589. *F. ambigua* Vasey, not Le Gall. A rather stout erect perennial: stems erect, 2½-4 feet high: sheaths scabrous, longer than the internodes: ligules very short: leaves of sterile shoots rather rigid, 7-10 inches long, those of the stem usually 4, flat or becoming involute, with long attenuate points: panicle 7-10 inches long, its branches flexuous, mostly in pairs, the longest 3-5 inches long: spikelets purplish, 3-4-flowered: empty glumes narrow, the first about 1 line long, the second 2 lines long, 3-nerved: flowering glumes 3-4 lines long, obscurely 5-nerved, scabrous, acuminate, bearing an awn 4-8 lines long: palea 2-toothed. Oregon.

F. Californica Vasey Cont. U. S. Nat. Herb. i, 277. Stems erect, rather stout, 2-5 feet high, from a perennial root: leaves of sterile shoots numerous, scabrous, involute, ¼-½ as long as the stem, about 2 lines wide, of the stem usually 2: sheaths scabrous, shorter than the internodes hairy at the throat: ligules a ciliate fringe: panicle open, pyramidal, 4-7 inches long, the lower branches slender, mostly in distant pairs, the longest 2-5 inches long: spikelets 4-6-flowered 6-8 lines long, empty glumes ovate-lanceolate; the first 3 lines long, the second 3½ lines long: flowering glumes linear-lanceolate, 4-5 lines long, bearing a short awn, scabrous: palea scabrous, linear, 2-toothed. Edge of woods and open places, western Oregon.

F. Howellii Hack. *F. viridula* Vasey. A densely tufted perennial: sheaths shorter than the internodes: ligules less than 1 line long: leaves of

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F. ELATOR L. Sp. 75. A tufted perennial: 2-6 feet high, often with short creeping rootstock: sheaths smooth, shorter than the internodes: ligules short: leaves of the stem 2-4, flat, 6-10 inches long, 2-3 lines wide: panicle contracted after flowering, 4-10 inches long: its branches mostly in pairs, the longest 3-5 inches long: spikelets linear-oblong, 6-11-flowered, 6-8 lines long: empty glumes lanceolate, the first $1\frac{1}{2}$ line long, the second a little longer; flowering-glumes oblong, acute, scabrous toward the tip. rarely awned, 5-nerved, $2\frac{1}{2}$ -3 lines long: palea linear, scabrous on the keel. Common in meadows and waste places: introduced from Europe.

F. Jonesii Vasey l. c. 278. A densely tufted, perennial: stems erect, 3-4 feet high: sheaths usually scabrous, shorter than the internodes: ligules less than a line long: radical leaves numerous, about half as long as the stem; those the stem 3-4, flat or involute, 5-15 inches long, 2-4 lines wide: panicle slender, open, 7-15 inches long, its capillary flexuous branches single or in pairs the lowest remote, 3-5 inches long: spikelets narrow, 3-5-flowered, 5-6 lines long: flowering glumes scabrous, linear-lanceolate, 2-3 lines long, 3-5-nerved: awns slender, 3-7 lines long: palea linear-lanceolate: stamens 3. Oregon to Brit. Columbia and Idaho.

F. brevifolia R. Br. Parry first Voy. Suppl. 280. A densely tufted perennial: stems rigid, 2-5 inches high: sheaths shorter than or equalling the internodes: leaves of sterile shoots setaceous, 1-3 inches long, those of the stem short or almost obsolete: panicle dense, linear, simple, racemose, 2-3 lines long: spikelets elliptical, 3 lines long, 1-4-flowered: empty glumes scarcely equal, the second broadly lanceolate: flowering glumes 1-2 lines long, elliptical-lanceolate, keeled above: awn 1 line or less long: palea oblong, acute, 2-toothed. On high mountains eastern Oregon to Alaska and the Rocky Mountains.

F. ovina L. Sp. 73. A densely tufted perennial: stems slender, erect, rigid, simple, 6-20 inches high: sheaths usually crowded at the base of the stems: ligules short: leaves filiform or setaceous, those of the stem few, 1-3 inches long, erect, the basal ones numerous: panicle 1-3 inches long, often secund, narrow, its branches short, usually erect or appressed: spikelets 3-5-flowered: empty glumes unequal, acute, the first 1-nerved, the second 3-nerved; flowering glumes $1\frac{1}{2}$ -2 lines long, smooth, acute, usually short-awned. On plains and rocky slopes in various forms, Mexico to Alaska and across the continent: also Europe and Asia.

Var. duriuscula Hack. Monog. Fest. Eu. 89. *F. duriuscula* L. Stems taller and stouter, panicle usually more open: flowering glumes about 3 lines long. Oregon to Alaska and the Rocky Mountains: also in Europe.

Var. polyphylla Vasey, Beal l. c. 597. Stems $2\frac{1}{2}$ -3 feet high, grooved below the panicle: leaves of sterile shoots numerous; sheaths split for most of their length: panicle open, 4-8 inches long; spikelets linear-lanceolate, 5-flowered: the second glume ovate-lanceolate 3-nerved. flowering glumes slender 3- $3\frac{1}{2}$ lines long. Oregon.

Var. ingrata Hack. in herb. Beal l. c. 598. Stems 20-30 inches high; leaves of sterile shoots scabrous, 8-10 inches long; those of the stem 3-5 inches long; panicle 4-6 inches long: its branches in pairs or single the longest about 2 inches long; spikelets 6-8-flowered: the second glume

linear, acute, 3-nerved, about 3 lines long; flowering glumes elliptical-lanceolate, about 3 lines long, the awn $\frac{1}{2}$ -2 lines long. Southern Oregon.

Var. Columbiæna Beal l. c. 599. Stems 20-30 inches high, with 2 nodes; sheaths smooth; leaves of sterile shoots 7-12 inches long, firm, glaucous; scabrous, nearly cylindrical: panicle thin, 2-7 inches long, its branches scabrous, the longer 2-3½ inches long; spikelets 4-7 lines long, 3-7-flowered, the first empty glume narrow about 2 lines long, the second linear, acute, 2½-3 lines long; flowering glumes 3-3½ lines long. About Pullman Washington.

Var. Oregana Hack. Beal l. c. 599. Stems slender, 2-3 feet high: leaves of sterile shoots 4-6 inches long, panicle thin, 2-4 inches long, its branches solitary, the longest 1-2 inches long; spikelets 2-6-flowered; second glume linear, subulate, 3 lines long; flowering glumes linear, 3 lines long, palea a little longer than the glumes. Eastern Oregon.

F. amethystina L. Sp. 74. A tufted perennial: stems rather slender, 2-3 feet high, with 2-3 nodes: sheaths shorter than the internodes: ligules a mere ciliate ring: leaves of sterile shoots flaccid, conduplicate, 5-15 inches long: those of the stem 2-3, the upper 3-5 inches long: panicle simple; secund, narrow or spreading, 4-8 inches long, the lower branches usually in pairs, scabrous, the longer 4-5 inches long: spikelets linear-lanceolate or oval 3-7-flowered, about 3½ lines long: first empty glumes lanceolate, 1½ line long, the second linear-lanceolate, about 2 lines long: flowering glumes scarious, lanceolate-oblong, 2-3 lines long: involute, awnless or with an awn $\frac{1}{4}$ -1 line long: palea linear, 2-toothed, scabrous on the keels. Oregon to California, also in Europe.

F. scabrella Torr. Hook. Fl. ii, 252, t. 233. An erect tufted perennial 2-4 feet high: sheaths smooth: ligules acute, 1-5 lines long: leaves of sterile shoots numerous, smooth or scabrous, involute, those of the stem usually 2, rigid, scabrous above, 3-5 inches long: panicle thin, 5-7 inches long, its branches mostly in pairs, 3-5 inches long: spikelets 3-7-flowered, 4-7 lines long: empty glumes chartaceous, ovate-lanceolate, the first 1-nerved, 2-3 lines long, the second 3-nerved 2-3½ lines long: flowering glumes oblong, scabrous, 5-nerved, 3-4 lines long, sometimes with a stout awn about $\frac{1}{2}$ line long. Eastern Washington to Alaska and Iowa.

F. rubra L. Sp. 74. A densely tufted perennial: stems ascending, geniculate at base, 1½-2½ feet high, from running rootstocks, sheaths usually shorter than the internodes, ligules very short, truncate: basal leaves involute-filiform: 3-6 inches long, those of the stem erect, flat or involute: panicle 2-5 inches long, sometimes red, open in flower, contracted in fruit: spikelets 3-10-flowered, 4-6 lines long: empty glumes acute, the first 1-nerved, shorter than the 3-nerved second one: flowering glumes about 3 lines long: obscurely 5-nerved, sometimes scabrous, bearing awns of less than their own length. Oregon to Alaska and Labrador.

Var. fallax Hack. Fest. Eu. 142. Densely caespitose, glaucous, strongly tinged with purple. 20-30 inches high: panicle 3-4 inches long: spikelets elliptical-lanceolate, 2-7-flowered: flowering glumes 2-3 lines long, rather abruptly pointed with a very short awn. Oregon and Washington to the Rocky Mountains.

Var. trichophylla Hack. l. c. 141. Stems slender, about 30 inches high, ascending from creeping rootstocks: lower sheaths shredded: panicle linear-oblong 3-5 inches long, flowering glumes linear-lanceolate, glabrous, bearing a short awn. Oregon and Europe.

Var. pubescens Vasey, Beal l. c. 607. Stems loosely tufted, 2-3

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feet high: panicle 5-7 inches long, interrupted, more or less pubescent throughout: spikelets 5-8-flowered: second glume oblong, abruptly acute, flowering glumes oval, acute: palets linear, acute, longer than the glumes. Oregon.

Var. littoralis Vasey, Beal l. c. Smooth and glaucous: stems 5-10 inches high, from creeping rootstocks: panicle dense, secund, 2-3 inches long: spikelets usually 5-flowered, the second glume ovate-lanceolate, 8-nerved, flowering glumes oval, acute: awns $\frac{1}{4}$ -1 line long. On sand banks along the coast of Oregon.

F. heterophylla Lam. Fl. Fr. ed. 1, 600. A densely caespitose perennial: stems slender, 2-3 feet high: sheaths smooth: leaves smooth, soft, convolute, those of the stem usually 3, flat: panicle 3-8 inches long, lax, nodding its branches in twos or threes: spikelets linear-oblong, 3-6-flowered: empty glumes unequal, very acute, the second subulate-lanceolate, 3-nerved; the lateral nerves short: flowering glumes linear-lanceolate, 3-4 lines long, very acute: awns half as long as the glumes or longer: palets linear-oblong. Washington to Brit. Columbia and Michigan.

49 BROMUS L. Sp. 76.

Annual or perennial grasses with flat leaves and numerous spikelets in terminal panicles, the pedicels thickened at the summit. Spikelets few to many-flowered, the two lower glumes empty, unequal, acute: flowering glumes rounded on the back, or sometimes compressed-keeled, 5-9-nerved, the apex usually 2-toothed, generally bearing an awn just below the summit. Palet shorter than the glumes. 2-keeled. Stamens usually 3. Stigmas sessile, plumose, inserted below a hairy cushion-like appendage at the top of the ovary. Grain adherent to the palet..

§ 1 EUBROMUS Annuals or biennials with empty glumes rather broad and flowering glumes broadly elliptic to oblong-elliptic. All introduced from Europe.

B. SECALINUS L. Sp. 76. Stems 1-3 feet high, erect, smooth: sheaths usually shorter than the internodes: ligules $\frac{1}{2}$ line long, crose leaves 2-6 inches long, 1-3 lines wide, sometimes rough or hairy: panicle open, its branches ascending or drooping: spikelets turgid, glabrous, 6-10-flowered: empty glumes scabrous toward the apex, the first 3-nerved, acute, second longer and broader, 7-nerved, obtuse: flowering glumes 3-4 lines long, broad, obtuse, rough toward the apex, awnless or bearing a straight awn between the obtuse teeth: palets about equalling the glumes. Common in fields everywhere.

B. RACEMOSUS L. Sp. ed. 2, 144. Stems erect, 1-3 feet high, smooth, or sparingly pubescent below the panicle: sheaths shorter than the internodes: ligules 1 line long: leaves 1-9 inches long, $\frac{1}{2}$ -4 lines wide, pubescent: panicle 1-10 inches long, its branches erect or ascending: spikelets erect, 5-11-flowered: empty glumes acute, the first 3-nerved, the second longer and broader, 5-9-nerved; flowering glumes broad, $3\frac{1}{2}$ -4 $\frac{1}{2}$ lines long, obtuse, smooth and shining, the nerves prominent: awns straight, 3-4 lines long: palets shorter than the glumes. Common in meadows and waste places.

VAR. COMMUTATUS Hook. f. Steud. Fl. Brit. 1sl. 451. Panicle rather broader: spikelets larger. Common in waste places.

B. HORDEACEOUS L. Sp. 77. **B. mollis** L. Stems 8-36 inches long, erect, often slender, usually pubescent below the panicle: sheaths shorter than the internodes, mostly pubescent: ligules $\frac{1}{2}$ line long: leaves 1-7 inches long, 1-3 lines wide, pubescent: panicle generally contracted, its branches erect or

ascending, 1-3 inches long: spikelets appressed-pubescent: empty glumes acute, the first 3-nerved, the second longer, 5-7-nerved: flowering glumes broad, obtuse, $3\frac{1}{2}$ - $4\frac{1}{2}$ lines long. In fields and waste places.

VAR. *GLABRESCENS* Shear U. S. Dept. Agr. Div. Agrostr. Bull. 23, 20. Spikelets glabrous or only scabrous throughout. In fields and waste places.

B. *BRIZIFORMIS* F. & M. Ind. Sem. Hort. Petrop. iii, 30. Stems 8-24 inches high, erect, glabrous; sheaths shorter than the internodes: the lower pubescent with soft villous hairs: ligules 1 line long, erose-truncate: leaves pubescent: panicle 1-3 inches long, open, the branches ascending or often drooping: spikelets few, $\frac{1}{2}$ -1 inch long, compressed: empty glumes very obtuse, the first 3-5-nerved, the second larger, 5-9-nerved: flowering glumes, 3-4 lines long, very broad, obtuse, 6-nerved, not awned. In fields and waste places.

§ 2 *STENOBROMUS* (Riseb. Annuals or biennials with mostly narrow glumes and rather long awns.

B. *MADRITENSIS* L. Cent. Pl. i, 5. A tufted annual: stems erect, or somewhat geniculate at base, smooth, 1-2 feet high; sheaths smooth, or the lower slightly pubescent: ligules about 1 line long, subtruncate and acerate: leaves 2-7 inches long, 1-2 lines wide: panicle erect, 2-6 inches long, oblong-ovoid, the lower branches somewhat spreading, 6-12 lines long: spikelets $1\frac{1}{2}$ -2 inches long, nearly smooth to scabrous, 7-11-flowered: empty glumes lanceolate, acuminate, the first 1-nerved, 5-7 lines long, the second 3-nerved, 7-8 lines long: flowering glumes linear-lanceolate 7-9 lines long, distinctly 3- or faintly 5-7-nerved, with 2 acute, hyaline teeth, bearing a long rough somewhat curved awn. Southern Oregon to California, naturalized from Europe.

B. *GUSSONI* Parl. Rar. Pl. Sic. 2, 8. An erect annual, 6-30 inches high: sheaths pilose-pubescent: ligules 1-2 lines long, rounded above: leaves pilose both sides: panicle lax, 4-8 inches long, the upper part somewhat drooping: spikelets usually 3-7-flowered, 4-6 lines long: empty glumes smooth, lanceolate acuminate, the first 8-10 lines long, strongly 1-nerved, the second broader and longer, prominently 3-nerved: flowering glumes 5-nerved, 10-12 lines long: awn stout, 2-2 $\frac{1}{2}$ inches long, very rough. In waste places, Washington to California and Arizona.

B. *RUBENS* L. Cent. Pl. i, 5. A tufted annual: stems about 10 inches high, erect, pubescent toward the top: sheaths pubescent: ligules $\frac{1}{2}$ -1 line long, lacinate-dentate: leaves 2-7 inches long, pubescent both sides: panicle erect, compact, ovoid, usually purplish, 2-4 inches long: spikelets mostly 7-11-flowered, 1-1 $\frac{1}{2}$ inch long: empty glumes acuminate, smooth to scabrous, the first narrow, 1-nerved, 3-5 lines long; the second broader and longer, 3-nerved; flowering glumes 7-8 lines long, lanceolate, acute, 5-nerved, scabrous, deeply cleft at the apex into 2 long-acuminate hyaline teeth: awns straight, 8-12 lines long. In waste places: introduced from Europe.

B. *STERILIS* L. Sp. 77. Stems $1\frac{1}{2}$ -3 feet high, erect, smooth, from an annual or biennial root: sheaths usually shorter than the internodes, the lower sometimes pubescent: ligules 1 line long: leaves 3-9 inches long, 1-3 lines wide, usually more or less pubescent: panicle 5-10 inches long, its branches ascending, or often widely spreading, not one-sided, stiff: spikelets few, 5-10-flowered, spreading or pendulous: empty glumes acuminate, glabrous, the first 1-nerved, the second longer, 3-nerved; flowering glumes 6-8 lines long, acuminate, 7-nerved, scabrous on the nerves: awns 7-12 lines long. In waste places; introduced from Europe.

B. *TACTORUM* L. Sp. 77. Stems 6-24 inches high, erect, from an annual root, simple, smooth: sheaths usually exceeding the internodes, at least

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the lower ones softly pubescent: ligules 1-2 lines long: leaves 1-4 inches long, 1-2 lines wide, softly pubescent: panicle 2-6 inches long, open, its branches slender and drooping, somewhat one-sided: spikelets numerous, 5-8-flowered, on capillary recurved slender pedicels: empty glumes acuminate, usually rough or hirsute; the first 1-nerved, the second longer, 3-nerved; flowering glumes 4-6 lines long, acuminate, 7-nerved, usually rough or hirsute: awns 6-8 lines long. In fields and waste places: naturalized from Europe.

§ 2 ZERNA Panz. Short-lived perennials, usually with a weak drooping panicle and more or less pubescent flowering glumes.

B. Pacificus Shear U. S. Dept. Agr. Div. Agrost. Bull. 23, 38. Stems stout, leafy, pubescent at the nodes, 3-6 feet high: sheaths mostly retrorse-pilose: ligules $1\frac{1}{2}$ -2 lines long rounded above, somewhat lacerate-dentate: leaves 8-14 inches long, 4-7 lines wide, sparingly pilose above, scabrous beneath: panicle dense, drooping, its lower branches secund: spikelets $1\frac{1}{4}$ inch long, 7-11-flowered, coarsely pubescent throughout: empty glumes acute, the first 1-nerved, or rarely with 2 short lateral nerves, 3-4 lines long, the second broader and 3-5-nerved; flowering glumes inconspicuously 7-nerved, broadly lanceolate, emarginate, 6-7 lines long: awn straight, 2-3 lines long. In moist thickets near the sea, Clatsop County, Oregon.

B. Oreuttianus Vasey Bot. Gaz. x, 223. An erect perennial 2-5 feet high, sheaths pubescent: ligules $\frac{1}{2}$ line long: leaves nearly smooth, 5-10 inches long, 3-9 lines wide: panicle erect, thin, 5-7 inches long, its branches in twos and threes, bearing 2-3 spikelets each, spreading: spikelets 4-8-flowered the first empty glume linear, acute, 1-3-nerved: 4 lines long, the second linear, almost acute, 3-nerved, 5-6 lines long, flowering glumes, scabrous, rounded on the back, lance-elliptical, 5-7-nerved, 6-7 lines long, obtuse: awn 2-6 lines long: palea linear. On the high mountains Washington to lower California.

B. vulgaris Shear l. c. 43. Stems slender, erect, 30-40 inches high, pubescent below the nodes, which are retrorsely bearded: sheaths pilose, with spreading or reflexed hairs: ligules truncate, 1-2½ lines long: leaves 7-12 inches long, 2-6 lines wide, thinly pilose above, glabrous or sparsely pilose beneath: spikelets covered with a short coarse pubescence, the first narrow, very acute 3-4 lines long: 1-nerved, the second much broader and longer, 3-nerved, scabrous on the back: flowering glumes about 6 lines long, sparsely pubescent, 5-nerved, awns slender, 5-6 lines long. In open woods: California to Brit. Columbia and Montana.

Var. eximius Shear l. c. 44. More erect and robust: sheaths and leaves glabrous: flowering glumes pubescent only on the midnerve and near the base. Eastern Oregon and Washington.

V. robustus Shear l. c. 44. Tall and leafy: sheaths and leaves sparingly pilose: panicle larger. Along the coast, Oregon to Brit. Columbia.

B. laevipes Shear l. c. 45. Stems 30-40 inches high, from short creeping rootstocks, pubescent just below the nodes: sheaths glabrous: ligules $1\frac{1}{2}$ -2 lines long, truncate, entire or lacerate-dentate: leaves 6-12 inches long, 2-4 lines wide: panicle lax, drooping, 7-10 inches long: spikelets drooping, narrow, terete, 5-9-flowered: empty glumes smooth, the first acute, 3-nerved, 3-6 lines long, the second broader, 5-nerved, 5-7 lines long: flowering glumes obtuse, 7-nerved, 6-8 lines long, densely pubescent on the margins and on the back at the base, hyaline and usually brownish-yellow at the apex: awn straight $2\frac{1}{2}$ -3 lines long: palea about 1 line long, shorter than the glumes. In thickets, Washington to California in the Coast and Cascade Mountains.

B. Suksdorfii Vasey Bot. Gaz. x, 223. An erect coarse tufted per-

ennial: stems smooth: or pubescent just below the nodes, 2-3 feet high: sheaths smooth: ligules about $\frac{1}{2}$ line long, truncate, dentate: leaves usually 5 or 6, 4-8 inches long, 5-8 lines wide, rather abruptly acuminate, firm and smooth; panicle narrow, erect, rather dense, 3-8 inches long, its branches erect, or ascending, the longest 1-2 inches long: spikelets 5-9-flowered, 1-1 $\frac{1}{2}$ inches long, terete at first: empty glumes glabrous, or scabrous on the nerves the first acuminate-lanceolate, 1-nerved, or sometimes with a pair of short lateral nerves, 5-6 lines long; the second broader, subacute, 3-nerved, 6-7 lines long: flowering glumes oblong-lanceolate subacute, 7-8 lines long, 5 or 7-nerved, appressed-pubescent near the base, emarginate at the apex: awn 1-2 lines long: palea about $\frac{1}{2}$ as long as the glumes. In open places on the high mountains, Washington to California.

B. INERMIS Leyss. Fl. Hal. 16. An erect smooth perennial: stems rather stout, smooth, 2-3 feet high: sheaths smooth: ligules $\frac{1}{2}$ -1 line long, subtruncate, somewhat lacerate: leaves smooth or minutely scabrous, 6-10 inches long, 2-6 lines wide: panicle, 5-10 inches long: spikelets narrow, terete, 1-1 $\frac{1}{2}$ inches long; empty glumes smooth, the first narrow, acute, 1-nerved 2-2 $\frac{1}{2}$ lines long; the second subacuminate, 3-nerved, 3-4 lines long: flowering glumes obtuse, emarginate, 5-nerved, 6-7 lines long: glabrous, with or without a short awn: palea equalling the glumes. In fields and waste places: introduced from Europe.

§ 3 *CERATOCHLOA* Beauv. as genus. Spikelets large, strongly compressed and more or less keeled.

B. marginatus Nees in Steud. Syn. Pl. Gram. 322. *B. brevistaratus* Buckley. A densely tufted coarse perennial: stems erect; 2-4 feet high, mostly pubescent or puberulent: sheaths pilose-pubescent: ligules 1 $\frac{1}{2}$ -2 lines long, lacinate: leaves somewhat sparsely pilose throughout, rather rough 6-12 inches long, 3-6 lines wide: panicle erect, rather narrow, usually 4-8 inches long, the lower branches somewhat spreading in flower, 1-3 $\frac{1}{2}$ inches long: bearing 2 spikelets: spikelets 1-2 inches long, lateral compressed, usually 7-9-flowered, erect or ascending: empty glume rather broad, scabrous, the first subacute, 3- or 5-nerved, 4-6 lines long, the second broader, obtuse, 6-7 lines long, 5-7-nerved, the lateral nerves broad: flowering glumes ovate-lanceolate, acute, coarsely pubescent, 6-8 lines long, 7-nerved, with short hyaline, teeth at the apex: and a stout straight awn 2-3 lines long: palea almost equalling the glumes. Common from California to Alaska and the Rocky Mountains.

Var. latior Shear l. c. 55. Larger and stouter: panicle larger with the lower branches 2-10 inches long, with the type.

Var. seminudus Shear l. c. 55. More leafy and less pubescent or nearly smooth, throughout: empty glumes glabrous or scabrous on the nerves. With the type.

B. polyanthus Scribn. & Shear l. c. 56. A rather stout erect perennial: stems erect, smooth, or puberulent at the nodes, 2-3 feet high: sheaths smooth, or sparsely pilose: ligules about 1 line long, rounded: leaves mostly scabrous: panicle elongated, erect, its branches usually short and erect or slightly spreading: spikelets 1 $\frac{1}{2}$ -2 inches long, 7-11-flowered: empty glumes broad, smooth or somewhat scabrous, the first 3-nerved, 3-4 lines long, the second 4-7-nerved, obtuse, 6-6 $\frac{1}{2}$ lines long: flowering glumes 7-nerved, 6-9 lines long, smooth or scabrous, obtuse, emarginate, with broad hyaline margins: awn 2-4 lines long. Washington to California and Wyoming.

B. Hitchensis Bong. Veg. Hitch. 173. Stems stout, leafy, smooth, 4-6 feet high: from a perennial root: sheaths shorter than the internodes, smooth: ligules large, rounded, entire or somewhat lacerate, 1 $\frac{1}{2}$ -2 $\frac{1}{2}$ lines long: leaves 8-16 inches long, 5-7 lines wide, sparingly pilose above, smooth beneath: panicle large, lax, drooping, 10-14 inches long: its lower

3 feet high: leaves usually glaucous, firm and flat, its branches 1-flowered, 1-2 lines long, glabrous on the upper surface with a pair of subacute, 3-4 lines long, 7-8 lines long, emarginate at the glumes. Perennial.

Perennial: stems 4-1 line long, scabrous, 6-10 lines long, narrow, acute, 3-4 lines long; glabrous. In fields

large, strongly

B. breviflorus: 2-4 feet high, ligules 1½-2 lines long, rather narrow, usually 1-flowered, 1-3½ lines long, lateral compresses rather broad, the second very broad; flowers 3-8 lines long, at straight awn common from California.

leaves larger with glabrous on the

erect perennial: sheaths smooth, glabrous mostly scabrous, direct or slightly curved, empty glumes 4 lines long, the second 7-nerved, 6-9 lines long, broad hyaline and Wyoming.

erect, smooth, 4-6 lines long, the internodes, 1½-2½ lines long, pilose above, long: its lower

branches 8-12 inches long, weak, spreading, usually bearing 1-3 spikelets on very slender pedicels: spikelets 1-3 inches long: empty glumes acute, smooth, or scabrous on the nerves, 4-6 lines long; the second 5-7 nerved, 6-7 lines long: flowering glumes broadly lanceolate, acute, 7-8 lines long, 7-nerved, shortly bidentate at the apex, with an awn 5-6 lines long: palea shorter than the glumes. Washington to Alaska, near the coast.

B. carinatus H. & A. Bot. Beech. 403. Stems 20-30 inches high, slightly pubescent at the nodes: sheaths mostly shorter than the internodes, retrorsely soft-pilose: ligules 1½-3 lines long, subclinate: leaves mostly narrow 4-10 inches long, 1½-3 lines wide thinly pilose both sides: panicle pyramidal, somewhat drooping: spikelets 1½ inches long, 5-9-flowered: empty glumes lanceolate, acute, glabrous to slightly scabrous; the first distinctly 3-nerved, or sometimes obscurely 5-nerved, 4-5 lines long, the second 5-nerved, 5-7 lines long, flowering glumes 7-nerved, pubescent or short-pubescent, 7-8 lines long, bifid at the apex and tapering into an awn 4-5 lines long; palea nearly equalling the glumes. Washington to California and Nevada.

B. Hookerianus Thunber Bot. Wilkes, ii, 493. An erect tufted perennial 20-30 inches high: sheaths smooth to densely hairy, ciliate at the throat: ligules ½-1 line long, leaves 7-12 inches long: 2-3 lines wide: panicle 7-15 inches long: spikelets 6-10-flowered: empty glumes smooth, compressed, acute; the first 5-nerved, 6-8 lines long, the second 7-8-nerved, 7-8 lines long: flowering glumes oval-lanceolate, scabrous or pubescent, 9-nerved, 7-8 lines long; awn 3-7 lines long. Brit. Columbia to California.

Tribe 8 Hordeæ Spikelets one-to several-flowered, usually hermaphrodite, sessile along the common rachis, forming a simple or compound spike. Glumes awned or awnless.

50 SCRIBNERIA Hack. Bot. Gaz. xiii, 105.

Annual grasses with slender stems and very slender spikes. Spikelets one-flowered, sessile and half embedded in the alternate notches of a more or less articulated usually simple spike. Rachella very short, articulated above the lower glume, extended as a short hairy awn beside the floret. Empty glumes 2, flowering glumes a third shorter than the first, membranous, keeled, bearing an awn between the teeth. Palea longer than the glumes. Stamens 1. Stigmas sessile, feathery. Grain free, linear, laterally compressed, with a groove.

S. Bolanderi Hack. Bot. Gaz. xiii, 105. Stems slender, tufted, often geniculate and with a few branches from the base, 2-12 inches high: sheaths loose, scarious-margined: ligules a line or more long, acute: leaves 3-10 lines long, convolute, mucronate: spike 1-4 inches long: very slender, spikelets 2-3 lines long, solitary or sometimes 2 at each joint; glumes very thick, except the first, 3-nerved, scarious-margined; the second slightly shorter and 2-3-nerved: flowering glumes indistinctly 5-nerved, smooth and shining below, scabrous near the irregular 2-toothed apex, the mid-nerve excurrent as an awn nearly as long as the glume. Along roadsides, southern Oregon to California.

51 LOLIUM L. Sp. 83.

Annual or perennial grasses with flat leaves and terminal spikes. Spikelets several-flowered, solitary, sessile, alternate in the notches of the usually continuous rachis, compressed, the edge of the spikelets turned toward the rachis: glumes rigid, the lower one

empty in the lateral spikelets and the two lower ones empty in the terminal one: flowering glumes rounded on the back, 5-7-nerved: palets 2-keeled. Stamens 3. Styles distinct, very short, with plumose stigmas. Grain adherent to the palets.

L. PERENNE L. Sp. 83. Stems 6-30 inches high, erect, simple, smooth, from a perennial root: sheaths shorter than the internodes: ligules very short: leaves 2-5 inches long: 1-2 lines wide, spike 3-8 inches long: spikelets 5-10 flowered, 4-6 lines long, empty glumes shorter than the spikelets, strongly nerved; flowering glumes 2-3 lines long, obscurely nerved, acuminate or awned, the awn sometimes nearly as long as the glume. Common in waste places: naturalized from Europe.

L. TEMULENTUM L. Sp. 83. Glabrous throughout: stems 2-4 feet high, erect, simple, from an annual root: sheaths longer than the internodes: ligules a line long or less: leaves 4-10 inches long, 1-3 lines wide, smooth beneath, rough above: spike 4-12 inches long: spikelets 4-8 flowered, 5-9 lines long, the strongly nerved empty glumes equalling or exceeding the obscurely nerved flowering ones. In fields: naturalized from Europe.

52 AGROPYRON J. Gärtn. Nov. Comm. Petrop. xiv, pt. 1, 539.

Annual or perennial grasses with flat or involute leaves and terminal spikes. Spikelets 3- to several-flowered, sessile, solitary and alternate at each notch of the usually continuous rachis, the side of the spikelet turned toward the rachis. Glumes rounded on the back, the two lower empty: flowering glumes rigid, rough on the back, 5-7-nerved, usually acute or awned at the apex. Palets 2-keeled. Stamens 3. Styles very short, distinct. Stigmas plumose. Grain pubescent at the apex, usually adherent to the palet.

A. divergens Nees in Steud. Syn. Pl. Gram. 347. A slender densely tufted glaucous perennial 1-3 feet high: lower sheaths longer than the internodes, upper ones shorter: ligules very short: basal leaves numerous, 4-12 inches long: those of the stem 2-4 inches long, all more or less convolute and setaceous, nearly smooth: spikelets 3-8 inches long, slender: spikelets 3-6 flowered; first empty glumes 3 lines long, 3-nerved, the margins scabrous; the second 4 lines long, 5-nerved, with the midrib at one side, awnless; flowering glumes, 4-5 lines long, plainly 5-nerved above: awn stout, diverging or recurved, longer than the glumes. Common on dry plains east of the Cascade range. Brit. Columbia to California and the Rocky Mountains.

Var. inermis Scribn. & Smith U. S. Dept. Agr. Div. Agrost. Bull. 4, 27. Empty glumes unequal, narrowly lanceolate, acute, 4-6 lines long; flowering glumes 5-6 lines long, smooth: acute, or acuminate, awnless or with a straight or spreading awn shorter than the glume. Eastern Washington to Brit. Columbia and Idaho.

Var. tenuispicatum Scribn. & Smith l. c. Stems 2-3 feet high: leaves very narrow, spikes slender, flexuous, 3-6 inches long: spikelets 5-7 lines long: awns 5-9 lines long, slender, straight, curved or divergent. On high dry plains, eastern Oregon to Brit. Columbia, Montana and Wyoming.

A. Vaseyi Scribn. & Sm. l. c. Stems rigid, erect, wiry, 1-1½ feet high, glabrous, or glaucous: sheaths glaucous, shorter than the internodes: ligules very short, leaves minutely strigose-pubescent above, rigid, 1-6 inches long, 1 line or less wide: spikes very slender, 2-4 inches long: spikelets 4-5 lines long, 3-5 flowered: empty glumes oblanceolate, acute

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or acuminate, slightly unequal, scarious along the margins 3-4 lines long: flowering glumes 4 lines long, lanceolate, acute, tipped with a stout divergent awn 4-5 lines long. On dry plains, eastern Oregon and Washington to the Rocky Mountains.

A. caninum Beauv. Agrost. 102. Stems 1-3 feet high, erect, smooth: sheaths usually shorter than the internodes, smooth, or the lower sometimes pubescent: ligules short: leaves 3-9 inches long, 1-3 lines wide, smooth beneath rough above: spikes 3-8 inches long, sometimes one-sided, often nodding at the top: spikelets 3-6 flowered: empty glumes 4½-6 lines long, 3-5-nerved, acuminate, awn-pointed or bearing an awn. 1-3 lines long: flowering glumes 4-5 lines long, usually scabrous toward the apex, acuminate into an awn sometimes twice their own length. Eastern Oregon to Brit. Columbia, New Brunswick and North Carolina: also in Europe.

A. tenerum Vasey Bot. Gaz. x, 253. Stems 1-3 feet high, erect, often slender, glabrous: sheaths usually shorter than the internodes, glabrous: ligules very short: leaves 3-10 inches long 1-2 lines wide, flat, or involute, rough: spike 3-7 inches long, usually narrow and slender: spikelets 3-5 flowered: empty glumes 4-6 lines long: acuminate or short-awned, 3-5-nerved, scabrous, on the margins: flowering glumes 5-6 lines long, 5-nerved, awn-pointed or short-awned, scarious-margined, often rough toward the apex. On dry plains, eastern Oregon to Brit. Columbia and Minnesota.

Var. longifolium Scribn. & Smith l. c. 30. Stems 3-4 feet high, smooth, and shining, rigid: leaves involute, nearly as long as the stems, long attenuate-pointed: spike slender, cylindrical, 9-10 inches long: glumes all short-awned. Northwestern California to Brit. Columbia.

A. brevifolium Scribn. U. S. Dept. Agr. Div. Agrost. Bull. 11, 55. Stems slender, densely caespitose, 12-16 inches high, usually geniculate at the lower nodes, smooth: lower sheaths scabrous and somewhat purplish, smooth: ligules short: leaves 1½-3½ inches long, 1-2 lines wide, very acute, strigose, scabrous above, very smooth beneath: spikelets approximate, usually 3-flowered, empty glumes narrowly lanceolate, 2-3-nerved, scabrous on the keel, short-awned: flowering glumes 6 lines long, 5-nerved, scabrous on the back, short-awned. On mountain sides, eastern Wash.

A. violaceum Vasey Spec. Rep. U. S. Dept. Agr. 45. Stems 6-24 inches high, erect, smooth: sheaths usually shorter than the internodes: ligules very short: leaves 2-6 inches long, 1-3 lines wide, flat or involute, rough, or sometimes smooth beneath, spikes 1-6 inches long, 2-3 lines broad: spikelets 3-6 flowered: empty glumes broad: usually purplish, scabrous-margined, 5-7-nerved, 4-6 lines long, acute, or acuminate, sometimes awn-pointed or long-awned: flowering glumes often purplish, 5-7-nerved, scabrous-margined, 4-6 lines long, acuminate or short-awned. Idaho to Alaska and Ontario: also in Europe and Asia.

A. Scribneri Vasey Bull. Torr. Bot. Club x, 128. Stems densely tufted, geniculate near the base, slender, 16-30 inches high, sheaths longer than the internodes: ligules obsolete: leaves 1-3 inches long, involute, narrow and rigid: spikes 2-4 inches long: spikelets 3-6 flowered: empty glumes 3-4 lines long, linear-lanceolate, 3-5-nerved, acuminate into a long point: flowering glumes oblong-lanceolate, 4 lines long, smooth, the mid-nerve extended into a strong spreading or recurved awn. On high mountains Washington to California and the Rocky Mountains.

A. Smithii Rydb. *A. glaucum* of American Authors, not of R. & S. Glabrous: stems rigid, erect, 1-4 feet high: sheaths smooth, shorter than the internodes: ligules very short: leaves rigid, bluish-green, smooth or slightly scabrous beneath, rough-scabrous on the margins, becoming in-

volute, 4-7 inches long, 2-3 lines wide, those of sterile shoots narrower and sometimes half as long as the stems: spikes 3-7 inches long; spikelets 6-12 lines long, 7-13-flowered: empty glumes lanceolate, acuminate or awn-pointed, scabrous on the nerves: flowering glumes 4-6 lines long, narrowly lanceolate, acute to awn-pointed, rounded on the back; smooth or thinly pubescent. In meadows, Oregon to Brit. Columbia and Minnesota.

Var. molle Scribn. & Smith l. c. Glumes and rachis more or less villous-pubescent. Washington to the Saskatchewan and New Mexico.

A. Elmeri Scribn. U. S. Dept. Agr. Div. Agrost. Bull. 11, 54. Stems erect 3-5 feet high, from strong creeping rootstocks: sheaths smooth, the lower ones longer than the internodes ligules short, minutely fringed along the edge: leaves 6-12 inches long, 2-6 lines wide, strigose, scabrous above, smooth beneath, long attenuate-pointed spikelets 6-10-flowered: empty glumes lanceolate, very acute or subaristate, rigid, about 1 line long, 3-nerved, scabrous on the nerves: flowering glumes broadly lanceolate, sharply acuminate, 5-nerved, short-pubescent on the back. On sandy banks of Snake river, Washington.

A. dasytachyum var. subvillosum Scribn. & Smith l. c. 33. More or less glabrous: stems slender 2-4 feet high: sheaths nearly as long as the internodes: ligules a mere ring: leaves of sterile shoots $\frac{1}{2}$ - $\frac{3}{4}$ as long as the stems: spikes 5-7-flowered: empty glumes ovate-lanceolate acute to acuminate: flowering glumes 3-5 lines long, pubescent to lanate. Eastern Washington to Montana and Colorado.

A. lanceolatum Scribn. & Smith l. c. 34. Pale yellowish-green or glaucous: stems 2-3 feet high: sheaths somewhat inflated, shorter than the internodes: ligules very short: leaves 6-12 inches long, about 2 lines wide, scabrous beneath and on the margins: pubescent to thinly hirsute above; spikes 4-6 inches long; spikelets 5-10 lines long, 4-7-flowered; empty glumes unequal, narrowly lanceolate, or oblanceolate, acuminate, 3-4 lines long, 3-5-nerved; scabrous on the nerves; flowering glumes. 4-7 lines long, broadly lanceolate, acute, mucronate, truncate or bidentate, rounded on the back, more or less pubescent, 3-nerved and scabrous toward the apex. Eastern Oregon and Washington to Idaho.

A. pseudorepens Scribn. & Smith l. c. 34. Stems 1-3 feet high, erect or ascending from a geniculate base: sheaths glabrous, shorter than the internodes: ligules 1 line long or less: leaves scabrous throughout, 4-8 inches long, 1-3 lines wide; spikes 3-8 inches long: spikelets 3-7 flowered, 8-9 lines long, erect, and appressed: empty glumes linear-lanceolate acuminate or awn-pointed, 5-nerved, scabrous on the nerves and scarious-margined: flowering glumes linear-oblong, acuminate, rounded on the back, 5-nerved, scabrous. Washington to Brit. Columbia, Nebraska and Texas.

Var. magnum Scribn. & Smith l. c. 35. Robust, 3-4 feet high: leaves 8-22 inches long: spikes 6-8 inches long, one-side: spikelets crowded, acute, an inch long. Idaho to Montana and Colorado.

A. repens Beauv. Agrost. 146. Stems 1-4 feet high, from long running jointed rootstocks: sheaths usually shorter than the internodes, glabrous: leaves 3-12 inches long, 1-5 lines wide, smooth beneath, scabrous above: spikes 2-8 inches long, strict: spikelets 3-7-flowered: empty glumes strongly 5-7-nerved, usually acute, or awn-pointed: flowering glumes acute or short-awned. Naturalized from Europe.

53 HORDEUM L. Sp. 84.

Annual or perennial grasses with flat leaves and terminal cylindrical spikes. Spikelets 1-flowered, usually in threes at each joint of the rachis, the lateral generally imperfect. Rachilla

produced beyond the flower, the lower empty glumes often reduced to awns and forming an apparent involucre around the spikelets. Empty glumes rigid: the flowering ones rounded on the back, 5-nerved at the apex, awned. Palea about equalling the glumes, 2 keeled. Stamens 8. Styles very short, distinct. Grain usually adherent to the glume, hairy at the summit.

H. jubatum L. Sp. 85. Stems 10-30 inches high, erect, usually slender smooth, sheaths usually shorter than the internodes: smooth: ligules $\frac{1}{2}$ line long, or less: leaves 1-5 inches long, 1-2 lines wide, erect, rough: spikes 2-4 inches long: spikelets usually in threes, the central one, containing a perfect flower; lateral ones imperfect: empty glumes consisting of slender rough awns 1-2 $\frac{1}{2}$ inches long: flowering glumes of the central spikelets 3-4 lines long: scabrous at the apex, bearing a slender rough awn 1-2 $\frac{1}{2}$ inches long, the corresponding glume of the lateral spikelets short-awned. On dry soil eastern Oregon to California, Pennsylvania and Labrador.

H. maritimum With. Arrang. 172. A smooth somewhat glaucous annual: stems 6-18 inches long: sheaths about as long as the internodes, the upper one inflated: ligules a mere ring: leaves 1-3 inches long, mostly involute: spike subterete, scarcely exerted, 1-2 inches long, the rachis breaking up when mature: spikelets an inch long, including the stiff awns: empty glumes all lanceolate, not ciliate, one of each lateral spikelet a little broader. Southwestern Oregon to California: introduced from Europe.

H. gussonianum Parl. Pl. Palerm. 244. Stems smooth often decumbent, 10-18 inches long: leaves thin, flat, finely pubescent, 1-3 inches long, about 1 line wide: spikes subterete, exerted, 1-2 inches long, breaking up when mature, empty glumes reduced to mere bristles, 6-8 lines long, except the inner one to each lateral spikelet is twice as wide as the others: flowering glumes oval, rough, 5-nerved, the awn 8 lines long. Oregon to California, introduced from Europe.

H. murinum L. Sp. 85. A coarse decumbent annual: sheaths about equalling the internodes: ligules very short: leaves 1 $\frac{1}{2}$ -3 inches long, often hairy: spike 2-4 inches long: often partly included in the upper sheath slightly compressed, soon breaking up when mature: spikelets, including the awns, 1-2 inches long, empty glumes of the middle spikelets lanceolate, with ciliate margins: flowering glumes scabrous above, flat on the back, 8-10 lines long. In waste places, introduced from Europe.

H. pusillum Nutt. Gen. i, 87. Stems 4-16 inches high, smooth: sheaths loose, usually shorter, than the internodes, smooth, the upper often enclosing the base of the spike: ligules very short: leaves 1 $\frac{1}{2}$ -3 inches long: $\frac{3}{4}$ -2 lines wide, smooth beneath, rough above: spike 1-3 inches long, spikelets usually in threes: glumes awned, the empty ones scabrous: flowering glumes smooth, that of the central spikelets 3-4 lines long: short-awned that of the lateral spikelets smaller. In dry soil California to Brit. Columbia Nebraska and Texas.

H. nodosum L. Sp. ed 2, 126. *H. pratense* Huds. Stems 1-4 feet high, often geniculate below, simple, smooth: sheaths shorter than the internodes: ligules $\frac{1}{2}$ line long, truncate: leaves 1 $\frac{1}{2}$ -6 inches long, 1-3 lines wide, flat, rough: spike 1-4 inches long, flat, often arcuate: empty glumes awn-like: flowering glumes of the central spikelets 3-4 lines long, bearing an awn 3-6 lines long: that of the lateral spikelets much smaller. Common in meadows, California to Alaska, Indiana and Texas also in Europe and Asia.

H. boreale Scribn. & Smith l. c. 24. Stems slender, erect, smooth: sheaths shorter than the internodes the lower ones pubescent: ligules very

short, leaves 4-6 inches long, 2-4 lines wide, scabrous: empty glumes awn-like 7-9 lines long, those of the lateral spikelets exceeding the other; flowering glume of the central spikelets 5 lines long, broadly lanceolate, scabrous toward the apex, bearing an awn about 5 lines long, that of the lateral spikelets smaller, subulate-pointed or short-awned. California to Alaska.

54 ELYMUS L. Sp. 93.

Tall grasses with flat or involute leaves and dense terminal spikes. Spikelets 2- to several-flowered, sessile, usually in pairs, sometimes 3 or more in the alternate notches of the continuous or jointed rachis, the empty glumes forming an apparent involucre to the clusters. Two lower glumes empty, narrow, acute or awned: flowering glumes shorter, rounded on the back, 5-nerved, usually bearing an awn. Paleas a little shorter than the glumes 2-keeled. Stamens 3. Styles very short distinct, with plumose stigmas. Grain sparsely hairy at the summit, adherent to the palea.

E. saxicolus Scribn. & Smith U. S. Dept. Agr. Div. Agrost. Bull. 11, 56. A rather slender wiry densely caespitose perennial: stems 3-5 inches high, pubescent: sheaths pubescent: ligules very short: leaves 3-10 inches long, 1-2 lines wide, pubescent on both sides, attenuate-pointed spikelets 2-5-flowered, about 9 lines long: empty glumes narrowly lanceolate, 1-3-nerved, about 3 lines long: awns divergent, 10-12 lines long: flowering glumes 6 lines long, smooth or slightly scabrous near the apex, rather broadly lanceolate and gradually tapering into a slender more or less divergent awn an inch long. Among boulders and rocky crevasses, summit of Mount Chapaca.

E. arenarius L. Sp. 83. Stems $1\frac{1}{2}$ -8 feet high, simple, usually softly pubescent at the summit: sheaths smooth, often glaucous, the lower longer and the upper shorter than the internodes: ligules very short: leaves 3-12 inches long, $1\frac{1}{4}$ -5 lines wide, flat or becoming involute, smooth beneath, rough above: spikes 3-10 inches long, usually strict: spikelets 3-9-flowered; empty glumes 8-14 lines long, 3-5-nerved, acuminate, more or less villous; flowering glumes 8-10 lines long, acute or awn-pointed, 5-7-nerved, usually very villous. On shores, California to Alaska and across the continent: also in Europe and Asia.

E. arenicolus Scribn. & Smith l. c. Cir. 9, 7. A stout erect glaucous perennial: stems simple, glabrous, 2-5 feet high; sheaths smooth or the upper ones strigose-pubescent, nearly as long as the internodes: ligules about $\frac{1}{2}$ line long, coarsely fimbriate: leaves rigid, deeply furrowed on both sides, strongly scabrous on the nerves, $1\frac{1}{2}$ -2 feet long, 1-4 lines wide, strongly involute and pungently pointed: spikes rather slender, 6-10 inches long, interrupted below: empty glumes subulate or narrowly lanceolate, rigid, scabrous above, 4-6 lines long: flowering glumes rounded on the back, acute, sparsely hirsute toward the base, 5-nerved, about 6 lines long. On sand-dunes along the Columbia river near the Dalles.

E. mollis Trin. Spreng. N. Endt. ii, 172. Stems stout, 3-7 feet high: sheaths smooth or more or less pubescent: ligules very short: leaves 16-20 inches long, 6-8 lines wide, strict and pungent: spikes erect, 10-16 inches long: spikelets 5-8-flowered, more or less soft-pubescent: empty glumes 1-1 $\frac{1}{2}$ inches long, 5-7-nerved: flowering glumes 8-10 lines long, 7-nerved. Along the coast, Washington to Alaska, and Maine to Nova Scotia.

E. flavescens Scribn. & Smith l. c. Bull. 8, 8. Stems stout, 2-4 feet high, usually pubescent just below the nodes: sheaths smooth, often somewhat glaucous, the lowest becoming loose and fibrous: ligules very short:

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leaves 10-20 inches long, 2-4 lines wide, smooth beneath, scabrous above, gradually tapering into very acute pungent tips: spikes linear, sometimes branching and panicle: spikelets 3-6-flowered, 6-12 lines long, villous with long whitish or yellowish hairs: empty glumes lanceolate, subaristate-pointed: flowering glumes broadly lanceolate, very acute, densely silky-villous on the back: flowering glumes 6-7 lines long. On sand dunes along the Columbia river near the Dalles.

E. dasystachys Trin. Ledeb. Fl. Alt. i, 120. Stems stout, smooth, 2-3 feet high, from stout creeping rootstocks: sheaths smooth or scabrous, shorter than the internodes: ligules very short: leaves rigid, more or less involute, pungent-pointed, 4-18 inches long, 2-4 lines wide: spike strict, 3-6 inches long: spikelets 2 at each joint, 10-12 lines long, closely imbricated, 4-7-flowered: empty glumes, equal, 7-8 lines long, more or less ciliate, short-awned, narrowly lanceolate 3-nerved: flowering glumes, more or less pubescent, slightly ciliate, 10-12 lines long, short-awned. Washington to Alaska and Montana.

E. littoralis Turcz. Stems rather stout and somewhat rigid, erect, 3-4 feet high, glabrous: sheaths glabrous, the lower ones scarious, loose and sometimes bladeless: ligules very short, minutely ciliate: leaves 10-20 inches long, 2-3 lines wide, glabrous beneath, strongly strigose-pubescent above, very long acuminate-pointed, becoming involute: spikes 10-12 inches long, rather loosely flowered, often branched: spikelets 5-9-flowered: empty glumes narrowly lanceolate, scabrous on the keel, especially toward the rigid subulate apex: flowering glumes 7-9 lines long, lanceolate, very acute, or subaristate-pointed, 5-nerved, scarious margined rather densely pubescent on the back below, the upper third glabrous. Eastern Washington to Idaho.

E. condensatus Presl Rel. Hænk. i, 265. Stems erect, smooth, 2-10 feet high: sheaths glabrous, the upper ones shorter than the internodes: ligules 2-3 lines long, truncate: leaves 6-20 inches long, 3-11 lines wide, scabrous above: spike 4-16 inches long, usually stout, strict, often interrupted below, sometimes branched at the base: spikelets 3-6-flowered: empty glumes subulate, $4\frac{1}{2}$ -6 lines long, 1-nerved, usually rough: flowering glumes 4-5 lines long, generally awn-pointed, usually scabrous. Common from eastern Oregon and Washington to Brit. Columbia, Nebraska, Arizona and California.

E. triticoides Buckl. Proc. Acad. Phila. 99. Stems rather slender, 2-4 feet high: ligules very short: leaves 7-12 inches long, narrow, often involute, the upper equalling or exceeding the stem: spikes 3-8 inches long, erect: spikelets 4-8-flowered, sometimes glaucous: empty glumes linear-lanceolate, rigid, long-pointed, 4-6 lines long: flowering glumes firm, lanceolate, acuminate or short-awned, 7-nerved. Washington to California and the Rocky Mountains.

E. glaucus Buckl. l. c. *E. Americanus* Vasey & Scribn. Stems erect, 2-5 feet high, smooth: sheaths often shorter than the internodes, usually glabrous: ligules 1 line long or less: leaves 4-12 inches long, 2-8 lines wide, smooth beneath, sometimes scabrous above: spike 5-8 inches long, slender: spikelets appressed to the rachis, 3-6 flowered: empty glumes narrowly lanceolate, 4-6 lines long, acuminate or awn-pointed, rigid, 3-5-nerved: flowering glumes smooth or slightly scabrous, 5-6 lines long: bearing a slender straight awn 6-9 lines long. In moist soil California to Brit. Columbia, Ontario, Michigan and Arizona.

E. Canadensis L. Sp. 83. Stems erect, 2-5 feet high, smooth: sheaths usually shorter than the internodes: ligules very short: leaves 4-12 inches long, 5-10 lines wide, scabrous, sometimes glaucous: spike 4-12 inches long, stout, often nodding: spikelets spreading, 3-5-flowered: empty glumes narrowly lanceolate, or subulate, rigid, 3-5-nerved, 4-8 lines long,

tapering into an awn as long or longer than the body: flowering glumes 4-7 lines long, nearly smooth to hirsute, bearing a slender scabrous awn, 1-2 inches long. On river banks and bars, Oregon to Nova Scotia, Georgia and Texas.

E. CAPUT-MEDUSÆ L. Sp. 84. Stems slender 12-20 inches long, geniculate below: sheaths about equalling the internodes: ligules very short: leaves 2-3 inches long, involute: spike stout, $1\frac{1}{2}$ -2 inches long, dense: spikelets 1-2-flowered: empty glumes narrow, rough, spreading, about an inch long: flowering glumes hispid, 3-4 lines long, gradually tapering into an awn 2-2½ inches long. On dry prairies, southwestern Oregon: introduced from Europe.

55 SITANION Raf.

Tall annual or perennial grasses with usually flat leaves and terminal spikes. Spikelets 1- to several-flowered, sessile, usually in pairs in alternate notches of the pointed rachis. Empty glumes forming an apparent involucre to the cluster: glumes very long, often 2-parted to the base, the divisions unequal, 2-cleft and long-awned: flowering glumes long-awned, 2-toothed or 3-awned. Palea a little shorter than the glumes, 2-keeled. Stamens 3. Styles very short, distinct, with plumose stigmas. Grain sparsely hairy at the summit, adherent to the palea.

S. elymoides Raf. Journ. Phys. lxxxix, 103. *Elymus Sitanion* Shultes. Stems simple smooth, 6-24 inches high: sheaths smooth to rough or hirsute, usually shorter than the internodes, the upper ones often inflated and enclosing the base of the spike: ligules short: leaves 2-7 inches long, $\frac{1}{2}$ -2 lines wide, usually scabrous, sometimes hirsute, flat or involute: spike 2-6 inches long: spikelets 1-5-flowered: empty glumes entire or divided, often to the base, the divisions subulate and bearing long unequal slender awns: flowering glumes 3-5 lines long, 5-nerved, scabrous toward the apex, bearing a long slender divergent awn 1-3 inches long. In dry soil, California to Brit. Columbia and Kansas.

S. glaber J. G. Smith. Stems stout, erect, densely caespitose, 12-20 inches high: sheaths loose, longer than the internodes, glabrous: leaves 2-6 inches long, glabrous beneath: spikes 2-4 inches long, barely exserted: awns of the flowering glumes 2-2½ inches long. Washington to California.

S. villosum J. G. Smith. Stems stout, mostly erect, 10-15 inches high: sheaths densely hirsute: leaves short, flat, strigose-pubescent and somewhat hirsute: spike 3-4 inches long, enclosed in the upper sheath: empty glumes 3-8-parted, each part bearing a slender awn 2-4 inches long: flowering glume lanceolate, 3-awned, the middle awn stout, 4-5 inches long, the lateral ones slender and usually shorter. Common in dry ground about Pullman, Washington.

S. Leckenbyi Piper Fl. Palouse Reg. 32. Stems stout, erect, 2½-3 feet high: sheaths glabrous or on sterile shoots ciliate: leaves stiff, erect, 2-7 inches long, involute glabrous beneath, strigose above, sharply acuminate: spike 5-7 inches long, slender, usually erect, long-exserted: empty glumes 4, equal, 2½-3 lines long, entire, setaceous: flowering glumes lanceolate, 5-6 lines long, smooth, at base, scabrous above, bifid at the apex and tipped with a straight awn 1½-2 inches long. Bars of Snake river at Wawawai, Washington.

S. flexuosum Piper l. c. Stems tufted 1½-3 feet high, erect: sheaths glabrous or on sterile shoots villous: leaves 2-6 inches long, involute, strigose-pubescent on both sides, or the upper nearly smooth: spike slender, erect, 4 inches long, long-exserted: empty glumes subulate-setaceous, 1-2

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lines long, tipped with an awn 5-6 lines long, sometimes with 2 very short lateral awns: flowering glumes lanceolate, smooth at the base, scabrous above, bifid, bearing a divergent awn $1\frac{1}{2}$ -2 inches long. Bars of Snake river at Wawawai, Washington.

S. Brodiaei Piper l. c. Stems erect, $1\frac{1}{2}$ -2 feet high: leaves stiff, smooth on both sides, involute, 5-7 inches long: spike pale green, long-exserted, erect, $2\frac{1}{2}$ -3 $\frac{1}{2}$ inches long: empty glumes subulate, entire, 4 lines long, bearing an awn 6 lines long: flowering glumes lanceolate, densely appressed-pubescent, 6 lines long, rarely with 2 short lateral awns. Bishop's Bar, Snake river, Washington.

CLASS 2, GYMNOSPERMÆ.

Monœcious or diœcious trees or shrubs, mostly evergreen, with usually rigid needle-like, subulate, or scale-like leaves. Ovules naked upon a scale, bract or disk, or within a more or less open perianth.

SYNOPTICAL KEY.

110 Taxaceæ Dioecious evergreens: flowers solitary and axillary: ovule solitary, in fruit a bony seed within a fleshy envelope or cup-shaped disk.

111 Pinaceæ Mostly monœcious and evergreen trees or shrubs: staminate flowers in aments: pistillate flowers in scaly aments becoming cones or berry-like, ovules 2 or more at the base of each scale.

ORDER 110 TAXACEÆ Lindl. Nat. Syst. ed. 2, §16.

Sparingly resinous trees or shrubs with scattered, in ours evergreen, linear leaves spreading in 2 ranks and diœcious axillary and solitary flowers achlamydeous and naked or surrounded by the imbricated and usually decussate bud-scales. Staminate flowers with the filaments monadelphous in a column, each filament surmounted by several more or less united pendent anther-cells, dehiscing longitudinally on the lower side. Pollen globose. Pistillate flowers of a solitary orthotropous ovule which in fruit becomes a bony-coated seed raised upon or more or less surrounded by or consolidated with a fleshy disk, cup or other coating. Embryo axile, in fleshy or farinaceous albumen. Cotyledons only 2, semiterete.

1 TAXUS L. Sp. 1040.

Trees or shrubs with evergreen spirally arranged short-pointed linear flat mucronate leaves, spreading so as to appear 2-ranked, and axillary and solitary sessile or subsessile very small aments. Staminate aments consisting of a few scaly bracts and 5-8 stamens, their filaments united to the middle: anthers 4-6-celled. Ovules solitary, axillary, erect, subtended by a fleshy annular disk, which is bracted at the base. Fruit consisting of the fleshy disk which becomes cup-shaped, red and nearly encloses the bony seed.

T. brevifolia Nutt. Sylva iii, 86 t. 108. A tree 20-90 feet high, by

1-3 feet in diameter, with slender spreading, or drooping branches: leaves 6-12 lines long, acuminate, and cuspidate, the margins somewhat revolute, bright green above, glaucous beneath, abruptly narrowed at the base into a short slender petiole: staminate aments $1\frac{1}{2}$ lines broad: fruit amber-red 3-6 lines in diameter, much flattened: seeds broadly ovate and somewhat flattened, acute: ovary 2 lines long. Common from western Brit. Columbia to California.

ORDER 111 PINACEÆ Lindl. Nat. Syst. ed. 2, 313.

Resinous trees or shrubs, mostly with evergreen narrow or scale like entire leaves and monoecious or rarely dioecious flowers. Staminate flowers reduced to the stamens only which are indefinite in number and often numerous, the filaments upon a central axis with the 2 or more anthers either adnate to the back of the connective or suspended from the under side of its scale-like or peltate summit, the cells dehiscing variously. Pistillate aments consisting of few to many scales, becoming a dry cone in fruit or fleshy and berry-like. Ovules naked, two or more at or on the base of each scale, adnate or free, erect or inverted. Seeds naked or winged, with chartaceous or crustaceous or sometimes bony testa. Embryo straight, axile, in fleshy oily albumen. Cotyledons two to several in a whorl.

TRIBE I CUPRESSINEÆ Scales of the fertile aments few, decussately opposite, apparently single, becoming a small cone or connate into a drupe-like globulus.

* Leaves opposite or in three's, never 2-ranked: flowers dioecious: fruit drupe-like, with bony ovate seeds.

1 *Juniperus* Ovules in pairs or solitary at the base of the fleshy scales: seeds 1-5 or more: fruit globose, ripening the second season.

* * Leaves opposite: flowers monoecious: fruit a dry cone.

+ Cone subglobose, of spreading, peltate or cuneate scales: seeds one or more to each scale, angled or narrowly winged.

2 *Chamaecyparis* Leaves and branches more or less 2-ranked: seeds one or two to each scale.

+ + Leaves 2-ranked: cone oblong, of imbricated or valvate oblong scales: seeds 2 or more to each scale, maturing the first year.

3 *Thuja* Scales 8-12, rather thin, imbricated: seeds equally 2-winged.

4 *Libocedrus* Scales thick-coriaceous, valvate, only the middle pair fertile: seeds unequally 2-winged.

TRIBE II, TAXODINEÆ Scales of the fertile aments more numerous and spirally arranged, in fruit forming a woody cone.

5 *Sequoia* Large trees with short-linear to ovate-lanceolate acute carinate leaves and ovate cones with cuneate spreading scales.

TRIBE III, ABIETINEÆ Scales of the fertile aments numerous, spirally imbricated, campellary, each in the axil of a thin distinct persistent bract, in fruit becoming coriaceous or ligneous and forming a strobile or cone.

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* Leaves not in sheaths, mostly entire: flowers on last years branchlets: cones maturing the first year.

+ Branchlets smooth, the leaf-scars not raised.

-- Leaves in fascicles at the ends of small branchlets, deciduous.

6 *Larix* Cones pendant at the ends of short branchlets, with thin persistent scale: seeds without resin vesicles.

-- -- Leaves solitary and scattered along the branchlets, persistent.

7 *Abies* Leaves sessile, leaving circular scars: cones erect, their scales and bracts deciduous from the central axis: seeds with resin vesicles.

8 *Pseudotsuga* Leaves petioled, the scars transversely oval: cones pendulous, their scales and bracts persistent on the central axis: seeds without resin vesicles.

+ + Branchlets rough from the prominent persistent leaf-bases: cones pendulous, their scales and bracts persistent on the central axis.

9 *Tsuga* Leaves petioled, with a single dorsal duct: seeds with resin vesicles.

10 *Picea* Leaves sessile, keeled on both sides, with 2 lateral complete or incomplete ducts: seeds without resin vesicles.

** Cones maturing in the second year their bracts becoming corky and thickened: leaves of the perfect plant in bundles of 1-5, from the axil of scarious bracts, their bases surrounded by a sheath of scarious bud-scales, usually serrulate.

11 *Pinus* Leaves needle-shape, the resin-ducts inconstant in number and variously placed.

Tribe 1. Cupressineæ. Cupressineæ and Juniperæ Endl. Syn. Conif. 6. Leaves decussately opposite or ternate, often dimorphous, usually scale-like and mostly adnate, the earlier ones free and subulate: leaf-buds not scaly. Anther-cells 2-8, introrse on the lower part of the face of the pettate connective-scale. Pollen-grains simple. Scales of the fertile aments few, decussately opposite, apparently single, becoming a small cone or connate into a drupe-like fruit. Ovules erect, solitary or rarely 2 to each scale. Cotyledons usually 2.

1 JUNIPERUS L. Sp. 1033.

Shrubs or trees with opposite or verticillate subulate or scale-like sessile evergreen leaves, usually of 2 kinds, and dioecious or sometimes monoecious small globose axillary or terminal aments. Staminate aments oblong or ovoid. Anther-cells 4-8 under each shield-shaped scale. Fertile aments of 2 or 3 series of fleshy scales, with 2 erect ovules to each scale, in fruit becoming united into a blue-black or reddish drupe, ripening the second season. Seeds 1-12, ovate, bony.

§ 1 *OXYCEDRUS* Spach Ann. Sc. Nat. 2nd. Ser. xvi, 289. Leaves ternate, free and jointed at the base, linear-subulate, pungent, channelled and white-glaucous above, not glandular-pitted.

J. communis L. Sp. 1040. A low tree or erect shrub 1-25 feet high: with shreddy bark, the branches spreading or drooping: leaves all subulate, rigid, spreading or some of the lower reflexed, mostly straight, verticillate

in threes, often with smaller ones in their axils, 5-10 lines long less than 1 line wide, channelled and commonly whitened on the upper surface: berry-like cones sessile or nearly so, dark blue, 3-4 lines in diameter. On dry hills, northern Washington to Brit. Columbia and Pennsylvania.

J. nana Willd. Sp. Pl. iv. 854. A depressed rigid shrub seldom over 18 inches high, forming irregular patches often 10 feet in diameter: leaves lanceolate, acute and cuspidate, 4-6 lines long, channelled and white above, dark green and carinate beneath, mostly incurved: aments axillary: berry-like cones blue, 3-5 lines in diameter. Common in the high mountains and along the coast. California to Alaska and across the continent: also in Europe and Asia.

§ 2 *SABINA* Spach l. c. 291. Leaves ternate or opposite, of 2 forms, mostly adnate and scale-like, closely appressed and crowded upon the branches and often glandular-pitted, occasionally more distinct, free and subulate.

**J. occidentalis* Hook. Fl. ii, 166. A rather small tree 20-50 feet high and 1-2 feet in diameter: leaves in threes scale-like, closely imbricated and appressed, ovate, acute, convex on the back: usually very resinous fruit on short branchlets, solitary, numerous, globose or obovoid, 3-4 lines in diameter, blue-black, resinous: seeds 1-3, deeply pitted. On very dry plains and banks, eastern Oregon to Brit. Columbia and Idaho.

J. scopulorum Sargent. *J. Virginiana* of authors as to the western trees. A tree 10-50 feet high, 1-2 feet in diameter: leaves mostly opposite; all those of young plants and commonly some of those of twigs of older trees subulate, spiny-tipped, 2-4 lines long, those of the mature branches scale-like, acute or subacute, closely appressed and imbricated, 4-ranked, causing the twigs to appear quadrangular: aments terminal: berry-like cones light blue, glaucous, about 3 lines in diameter, borne on straight peduncle-like branchlets of less than their own length, 1-2-seeded. In dry soil, eastern Washington to Brit. Columbia.

2 CHAMÆCYPARIS Spach Hist. Veg. ii, 329. (1842.)

Trees with minute opposite appressed 4 ranked scale-like evergreen leaves and small monœcious terminal aments. Staminate aments globose, with opposite 2-4-celled anthers, the cells globose, 2-valved. Fertile aments globose, with few peltate opposite scales each bearing 2-5 erect seeds, closed until mature, each with a central point or knob. Seeds winged, maturing the first year.

C. Lawsoniana Parl. DC. Prodr. xvi, 464. A tall tree 100-200 feet high and 2-6 feet in diameter, with slender spreading or drooping branches: leaves small, deep green with a glaucous margin when young, acute or acutish, more or less glandular-pitted: cones 4 lines in diameter glaucous when young, of 8-10 scales with the flattened summit crossed by a narrow transverse ridge: seeds 2-4 to each scale, wing-margined, 2 lines long. Along streams in the coast mountains, southern Oregon and northern California.

C. Nootkatensis Spach Hist. Veg. xi. 333. A slender tree 50-150 feet high and 1-3 feet in diameter at the base, with slender drooping branches and terete branchlets: leaves small, very acute, dark green, obscurely glandular: cones globose, 5-6 lines in diameter, of 4-6 thick green scales with very prominent central bosses: seeds 2-4 to each scale, thick and narrowly winged. On the highest parts of the Cascade Mountains, Oregon to Alaska.

3 THUJA L. Sp. 1002

Trees with thin fibrous bark, scattered branches and distichous evergreen foliage. Leaves opposite, adnate and imbricated in 4 rows, oblong, with free acute tips somewhat dimorphous. Flowers monœcious. Aments terminal, of few scales decussately imbricated in pairs. Staminate flowers numerous, very small, with 3 or 4 anthers under each of the 4 or 6 subpeltate broadly ovate pointed scales. Pollen grains simple. Fertile aments terminating stouter branchlets, of 8-12 erect scales, with 2 or more erect ovules at the base of each. Cones soon strongly reflexed, maturing the first season, small, the thin-coriaceous scales ovate, the lowest and uppermost pairs sterile. Seeds lanceolate and somewhat compressed, nearly equally winged.

T. plicata Don Hort. Cantab. ed. 6, 249. *T. gigantea* Nutt. A tall graceful tree 100-250 feet high and 2-12 feet in diameter at base: foliage light green and shining: leaves ovate, acuminate and subpungent: cones 5-8 lines long, ovate, cinnamon-colored, somewhat clustered at the ends of branchlets, the ovate scales with a thin acute usually appressed mucro, the lowest and uppermost pairs sterile, the others with 2-6 ovules: seeds a little shorter than the wings which are 3 lines long, distinct and slightly unequal. Frequent in forests California to Alaska and Idaho.

4 LIBOCEDRUS Endl. Syn. Conif. 42. (1847.)

Evergreen trees with smooth or fissured bark, scale-like leaves and monœcious or diœcious flowers. Leaves decussately opposite, imbricated by fours and dissimilar, the facial ones smaller, flat and appressed, the marginal ones bract-like and keeled. Aments solitary, terminal: the staminate ones with subpeltate scales, each with 3-4 longitudinally dehiscent anthers on the dorsal side. Fertile aments bracteate, with 4-6 decussately opposite erect scales, the lower pair usually sterile, the third when present connate into a longitudinal septum. Ovules 2 to each scale, flask-shaped. Cone ripening the first year, its scales subwoody, mucronate below the apex, erect, at length spreading. Seeds in pairs or solitary. Cotyledons two.

L. decurrens Torr. Pl. Fremont 7, t 3. A tall tree 100-150 feet high by 3-7 feet in diameter, with lax scattered spreading branches: leaves bright green, in 2 decussate pairs at each joint, closely adnate except the short acute tip, the lateral without glands and nearly covering the flattened obscurely pitted inner ones: staminate flowers ovate, of 12-16 scales: cones 9-12 lines long, scaly-bracted at base, oblong, the lower scales very short, the upper connate into a longitudinal septum, the middle pair convex, obtuse at the tip, all with a short acute somewhat incurved mucro: seeds oblong-lanceolate, 3-6 lines long, the narrow outer wing scarcely longer; the inner one broad and nearly equalling the scale. On dry hillsides, Oregon to California and Nevada.

Tribe 2 Taxodineæ. Leaves alternate. Scales of the fertile aments more numerous and spirally arranged, in fruit becoming a woody cone. Ovules erect: in some genera inverted.

5 SEQUOIA Endl. Syn. Conif. 198.

Tall trees with straight columnar trunks, short spreading bran-

ches, linear leaves and monoecious flowers. Aments terminal and axillary upon young shoots, of rather numerous spirally arranged scales. Staminate flowers small, involucrate with scale-like leaves, with 3-5 anthers under each subpeltate scale. Pollen grains simple. Fertile aments oblong-ovate, erect, with 3-7 inverted ovules at the base of each scale. Cones maturing the second year, woody, oval, the scales divergent at right angles from the axis, thick and wedge-shaped with a rhomboidal rugose umbilicate apex, setaceous-mucronate. Seeds compressed, oblong-obovate, with thick spreading margins. Cotyledons 4-6.

S. sempervirens Endl. Syn. Conif. 198. Erect evergreen trees 100-350 feet high by 4-20 feet in diameter, with thick fibrous spongy bark, comparatively short spreading branches and linear 2-ranked leaves: leaves bright green above, glaucous beneath, spreading distichously, those of the main branches appressed, acute, or acuminate and mostly pungent, 6-12 lines long, about 1 line wide: staminate aments about 2 lines long: cones oblong, 9-12 lines long by 6 lines thick, of about 20 scales: seeds brown, 3-2½ lines long. Near the coast, extreme southern Oregon and California.

Tribe 3. Abietinæ Endl. Syn. Conif. 79. *Leaf-buds scaly. Leaves scattered or fascicled, from linear to acicular. Staminate flowers spirally arranged and subtended by involucre scales: anther-cells extrorse, parallel and contiguous upon the sides of a very narrow connective which is often surmounted by a scarious dilated inflexed tip. Scales of the fertile aments numerous, spirally imbricated; carpellary, each in the axil of a thin distinct bract, in fruit becoming coriaceous or woody and forming a cone. Ovules in pairs, adnate to the inner face of each scale near the base, inverted. Seeds separating from the scale at maturity, conspicuously winged. Cotyledons 3-16.*

C. *LARIX* Adans. Fam. Pl. II, 480. (1763)

Tall trees with horizontal or ascending branches and small narrowly linear deciduous leaves without sheaths in fascicles on short lateral scaly bud-like branchlets. Aments short, lateral, monoecious; the staminate from leafless buds; the fertile buds commonly leafy at base and the aments red. Pollen grains simple. Cones ovoid or cylindric, small, erect, their scales thin, spirally arranged, obtuse, persistent.

L. occidentalis Nutt. Sylva III, 143, t. 120. A large tree 100-200 feet high and 1-6 feet in diameter, with thick reddish longitudinally fissured bark: branches short, horizontal, with glabrous branchlets: leaves narrowly linear, 1-2 inches long, in alternate fascicles of 12-18, promptly deciduous: cones ovate-cylindric, 1-1½ inches long, its scales broadly oblong, truncate, ciliate-fringed when young: bracts scarious, dilated at base, the narrow terminal part exerted. In the mountains of eastern Oregon and Washington to Idaho.

L. Lyallii Parl. et. Enuh. Sem. Reg. Fl. 259. A rather small tree 50-100 feet high with horizontal or ascending branches, the branchlets and bud-scales densely pubescent with whitish hairs: leaves narrowly linear,

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1-2 inches long, deciduous: cones oblong, $1\frac{1}{2}$ -2 inches long, promptly deciduous. In the Cascade Mountains of Washington.

7 ABIES Juss. Gen. 414. (1799.)

Evergreen trees with linear flat scattered leaves and monoecious flowers. Leaves sessile, often spreading so as to appear 2-ranked, but in reality spirally arranged, not jointed to a persistent base but leaving circular flat scars on the naked twigs. Staminate aments from the axils of the previous years leaves. Anthers 2-celled, the cells transversely dehiscent; the connective prolonged into a short knob or point. Pollen grains compound. Fertile aments lateral, erect. Ovules 2 to each scale. Cones erect, cylindric to ovoid, their broad obtuse scales deciduous from the persistent central axis.

A. grandis Lindl. Penny Cyc. 130. A tall straight tree 100-300 feet high and 2-6 feet in diameter, with smooth brownish blotched with white bark and spreading branches: leaves flat, dark glossy green and channelled above, glossy with two pale or white stripes beneath, 1-2 inches long: cones cylindric, retuse, 2-6 inches long, $1\frac{1}{2}$ inch thick, with scales nearly twice as broad as long: the quite short obcordate or 2-lobed bracts with or without a short point: wing of the seed very oblique, 2-4 lines long. Common in moist places in forests, Brit. Columbia to California and Idaho.

A. Lowiana Murr. Syn. Var. Conif. 27. A tall graceful tree 100-200 feet high and 2-3 feet in diameter, with, when mature, dark-colored fissured bark and spreading branches: leaves 2-ranked, 1-2 inches long, green above, green with two white stripes beneath: cones cylindric, 2-4 inches long, with scales nearly twice as broad as long; bracts not exerted: wing of the seed oblique. In the Siskiyou Mountains and southward.

A. concolor Lindl. Journ. Hort. Soc. v. 210. A large tree 100-200 feet high and 2-4 feet in diameter, with rough grayish bark and spreading branches: leaves mostly obtuse, pale green, those of younger trees and lower branches elongated, 2-3 inches long, 2-ranked, often slightly channelled, those of old trees and of upper branches shorter broader and thicker, convex above and often falcate, covering the upper side of the branchlets: cones oblong cylindric, 3-5 inches long $1\frac{1}{2}$ - $1\frac{3}{4}$ inch in diameter, pale green to dull purplish: scales 12-15 lines wide, nearly twice as wide as long: bracts truncate, not exerted: wing of the seed oblique, as long as wide. In the mountains at 3000-4000 feet elevation, southern Oregon to California.

A. lasiocarpa Nutt. Silva, III, 138. A small tree 50-75 feet high and 7-12 inches in diameter, with smooth whitish bark and drooping branches: leaves of the main branches $1\frac{1}{2}$ inches long, erect, acute and pungently pointed, those of the branchlets more or less spreading or curved upward, rigid and more or less pungent: cones cylindric, usually purple, 2-3 inches long, $\frac{3}{4}$ -1 inch thick: scales broader than long: bracts not exerted. On the highest peaks of the Cascade Mountains.

A. amabilis Forbes Pinetum Wob. 125, t. 44. A slender tree 10-150 feet high and 1-3 feet in diameter, with smooth whitish bark and spreading branches: leaves rigid, acute or obtuse, 1-2 inches long, on the lower branches and on young trees 2-ranked, on the upper parts of mature trees shorter and curved upward: cones dark purple, 2-4 inches long, 2-3 inches

in diameter: scales nearly twice as broad as long: bracts not exerted. On the higher parts of the Cascade Mountains.

A. nobilis Linell Penny Cyc. i, 30. A very large tree 200-300 feet high and 8-6 feet in diameter, with spreading branches and somewhat rough dark gray or blackish bark: leaves rigid, acute or obtuse, 1-2 inches long, on the lowest branches and on young trees somewhat 2-ranked, flattish and slightly grooved; on the upper branchlets curved upward and covering the upper side, glaucous and keeled on both sides: cones cylindrical-oblong, 5-9 inches long, 3-4 inches in diameter, almost covered by the exerted and reflexed cuneate cuspidate-pointed bracts: scales 12-18 lines wide by 12-15 lines long: seed slender, with a cuneate somewhat retuse wing nearly as long as the scale: cotyledons 7 or 8. Common in the high mountains at 4000-6000 feet elevation, Washington to California.

8 PSEUDOTSUGA Carr. Conf. ed. 2, 256.

Large trees with rough dark brown or whitish bark, flat distinctly petioled evergreen leaves, that are stomatose only on the lower side with 2 lateral resin-ducts close to the epidermis of the lower side, leaving on the branchlets scarcely prominent transversely oval raised scars. Flowers monoecious, from the axils of the previous year's leaves. Staminate flower an oblong or subcylindric column surrounded and partly enclosed by numerous conspicuous orbicular bud-scales: commissure of the anthers terminating in a short spur; the cells opening obliquely by one continuous slit: pollen grains ovate-subglobose. Pistillate flowers with the scales much shorter than the broadly linear acutely 2 lobed long-pointed or aristate bracts. Cones maturing the first year, with persistent scales and exerted bracts. Seeds without resin-vesicles. Cotyledons 6-10.

P. Douglasii Carr. l. c. A large tree 100-300 feet high and 2-15 feet in diameter: leaves linear, mostly obtuse, 8-18 lines long, but slightly if at all 2-ranked, glossy green above, white with a green midnerve beneath: staminate aments oblong-cylindrical, 5-10 lines long: cones oblong to cylindrical, 1-4 inches long: scales 10-14 lines wide, broader than long: bracts 2-3 lines wide, more or less exerted, acutely 2-toothed or lacerate at the apex, the prominent midnerve prolonged into a long subulate awn: seed triangular, convex and reddish-brown on the upper side, flat and white on the lower side, about 8 lines long, with an oblong usually obtuse wing 3-5 lines long. Common from Alaska to Mexico and the Rocky Mountains.

9 TSUGA Carr. Conf. 185.

Large evergreen trees with slender often drooping terminal branchlets and monoecious flowers. Leaves flat or somewhat angled, with a single dorsal resin duct, conspicuously petioled, articulated upon a prominent and at length ligneous persistent base. Staminate flowers a subglobose cluster of stamens in the axils of last years leaves, the long stipe surrounded by numerous bud-scales: commissure of the anthers terminating in a short spur or knob: anther-cells opening transversely by a continuous slit. Pistillate aments terminal on the previous year's branchlets: bracts somewhat shorter than the scales. Cones maturing the first year, pendulous, the scales and enclosed bracts persistent on

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T. heterophylla Sargent. *Abies heterophylla* Raf. *Tsuga Mertensiana* f. *authens* not of Carr. A very large tree 100-200 feet high and 2-6 feet in diameter, with rough rather thick bark: ultimate branchlets very slender, roughish and when young long-hairy: leaves linear, 4-9 lines long, abruptly petioled, entire or usually spinulose-serrate toward the rounded apex, shining above, when young with 2 white stripes beneath: staminate flowers 2-3 lines in diameter, shorter than the stipe: cones oblong-cylindrical, acute, 4-9 lines long, slightly pubescent: scales longer than wide: bracts truncate: seeds about 1 line long, the wing twice as long: cotyledons 2 or 4. In moist places in forests, California to Alaska.

T. Mertensiana Carr. (Conf. ed. 2, 25). *T. Pattoniana* Engelm. A large tree 100-200 feet high and 1-4 feet in diameter, with rough dark brown bark, slender pubescent branchlets and dark green foliage: leaves 6-12 lines long, angular, acutish, attenuate at the base, often curved, stomatose and keeled both sides, unequal and appearing as if in fascicles: staminate flowers about 2 lines thick, on a very slender stipe: cones cylindrical-oblong 2-3 inches long, 6-8 lines in diameter: seeds $2\frac{1}{2}$ lines long, with an obliquely obovate wing about 4 lines long. On the high mountains California to Alaska.

10 PICEA Link Abh. Akad. Wiss. Berlin 1727, 179.

Large evergreen trees with reddish flaky bark and spreading branches. Leaves keeled above and beneath, more or less quadrangular, articulated on a prominent, at last ligneous, persistent rhombic base, spirally arranged all around the branchlets, sometimes by a twist of the base somewhat 2-ranked: resin-ducts irregular. Staminate flowers axillary and terminal on the previous year's branchlets, with an oblong or cylindrical staminal column, its short stipe surrounded by numerous bud-scales: the commissure of the anthers expanding into a broad nearly circular erect crest: anther-cells opening longitudinally. Pollen-grains large, with 2 air-sacs. Pistillate anthers borne at the ends of short or longer branchlets, the scales much longer than the bracts. Cones maturing the first year, pendulous: scales and enclosed bracts persistent upon the axis. Seeds without resin-vesicles, imbedded in the membranous base of the wing which lays its under side nearly free and permits it to fall out. Cotyledons 4-8.

P. Breweriana Watson Proc. Am. Acad. xx. 378. A slender tree 100-150 feet high and 2-4 feet in diameter, with spreading or ascending branchlets and puberulent pendent branchlets, these sometimes 6-8 feet long and not more than 4 lines in diameter: leaves 5-12 lines long, strictly sessile upon the slender base, obtuse, smooth and rounded or slightly carinate above, stomatose beneath on each side of the slightly prominent midnerve: cones 2-4 inches long, 8-10 lines in diameter, narrowly cylindrical, attenuate at base: bracts linear-oblong, 2 lines long: scales thick, puberulent, obovate, with slightly thickened rounded summit, entire, 6-8 lines long: seeds $1\frac{1}{2}$ lines long, the wing 4 lines long, $2\frac{1}{2}$ lines wide. On dry rocky ridges in the Siskiyou and Coast Mountains of southern Oregon and adjacent California.

P. Engelmanni Engelm. Trans. St. Louis Acad. ii. 22. A tree 100-150 feet high and 2-5 feet in diameter with cinnamon colored bark and spreading branches with pubescent branchlets: leaves soft and flexible, standing out in all directions from all sides of the branchlets, tetragonal, acute, with callus

tips, slender, nearly straight on sterile branchlets, incurved and stouter on fertile ones, 1-1½ inch long, dark blue-green at maturity: staminate flowers oblong cylindrical, about 7 lines long, 4 lines thick, the stipe about 4 lines long: anthers dark purple: cones oblong-cylindrical to ovate, 1-8 inches long, gradually narrowed to each end: scales thin, straight, usually crose-dentate: seed black, about half as long as the broad very oblique wing. In wet places on the high mountains, Oregon to Brit. Columbia and the Rocky Mountains.

P. Sitchensis Carr. Conf. 290. A very large tree, 200-300 feet high and 4-12 feet in diameter with thin scaly red-brown bark: branchlets thick, rough with the prominent persistent leaf bases, glabrous: leaves 5-8 lines long, about 1 line wide, flattened, short-pointed or obtuse to acute, stomatose and when young white on the upper surface: cones cylindrical-oval, 1½-3 inches long, an inch thick or less: bracts lanceolate, rigid ½-¾ as long as the scales: scales yellowish, oblong soft, rounded and denticulate at the apex, 9-12 lines long: seeds slender 1¼-1½ lines long, the wing 4-5 lines long by 1-1½ lines wide, narrowly oblong or slightly oblique. Along the coast California to Alaska.

11. PINUS L. Sp. 100.

Evergreen trees of various sizes and aspect, with flaky bark and monoecious flowers. Primary leaves only on young plants and shoots, flat, subulate and serrulate: the secondary in bundles of 1-5, from the axils of bud-scales and surrounded at base by a more or less persistent sheath of membranous scales, needle-shaped, terete, semiterete or triangular according as bundles are of 1 or more, mostly delicately serrulate, with stomata on all sides: resin-ducts various in situation and number. Staminate aments an oblong or cylindrical often much elongated staminal column surrounded by a somewhat definite number of calyx-like bud-scales, the outer ones lateral and strongly keeled, from the axils of scales and crowded into a capitate or spicate inflorescence around the base of the same springs growth: anther-cells opening longitudinally, the connective terminating in a knob or semi-circular erect crest. Pollen-grains rather small, 2-lobed, with 2 air sacs. Pistillate aments axillary or subterminal, solitary or several together, the scales much larger than the bracts. Cones maturing the second year, scales more or less thickened and corky, the free exposed portion bearing a terminal or dorsal unarmed or prickly protuberance (umbo). Seeds without resin-vesicles, usually surrounded by the rim-like base of the wing which often spreads partly over the outer side of the seeds. Cotyledons 5-15.

§ 1 Leaves in fives with peripheral resin-ducts their sheaths loose and deciduous. Cones subterminal. Scales comparatively thin at the free exposed apex, with a terminal unarmed umbo. Anthers terminating in a knob or a few teeth, or in a short incomplete crest.

P. Lambertiana Dougl. Linn. Trans. xv, 500. A large tree 100-300 feet high and 5-20 feet in diameter, with light brown smoothish bark and spreading branches: leaves 3-4 inches long, rigid, with 5 or 6 lines of stomata

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on each of the 3 sides, serrulate: staminate aments oval, 6 lines long, with 10-15 involueral scales: anthers denticulate-crested: cones bright brown, 6-18 inches long, 3-4 inches in diameter, on peduncles 2-3 inches long: seeds smooth, black, 4-6 lines long: the obtuse wing not quite twice as long: cotyledons 13-15. On dry hillsides Oregon to California.

P. monticola D. Don, Lambert Pinus 111. A slender tree 100-200 feet high and 1-6 feet in diameter and rather slender spreading or somewhat drooping branches: bark of young trees light gray, on fully grown trees divided into nearly square plates covered by small closely appressed purple scales: leaves in fives, blue-green and glaucous, $1\frac{1}{2}$ -4 inches long, with brown or white soon deciduous sheaths: staminate flowers oval, 4-5 lines long, the stamens terminating in short crests or knobs surrounded by 8 bracts: pistillate flowers oblong-cylindric, with thin scales raised upon stout peduncles: cones 4-11 inches long, pendulous, 1-2 inches thick: scales thin, oblong ovate, $1\frac{1}{2}$ inches long, slightly thickened and smooth toward the apex, tipped with a small dark umbo: seeds narrowed at both ends, 4 lines long. On the high mountains, California to Brit. Columbia.

P. flexilis James Long's Exped. ii, 34. A stout tree usually 40-80 feet high with a short massive trunk 1-5 feet in diameter: with short stout flexible spreading or somewhat ascending branches and whitish or on old trees dark brown bark: leaves stout and rigid, sharp-pointed: with callous tips, dark green, about 2 inches long, with light brown or white soon deciduous sheaths: staminate flowers oval, about 6 lines long: the reddish anthers tipped with short crests surrounded by 8 or 9 scales: cones oval to subcylindrical, 3-10 inches long, about $1\frac{1}{2}$ inch thick: scales rounded at the broad or somewhat narrowed apex, tipped with a dark thickened umbo: seeds oval, 4-6 lines long. On the high mountains, eastern Oregon to California and the Rocky Mountains.

P. albicaulis Engelm. Trans. Acad. St. Louis ii, 209. A stout tree 20-60 feet high and 1-3 feet in diameter with smooth light-colored bark: leaves slender, $1\frac{1}{2}$ -3 inches long, with few rows of stomata on the inside, entire or nearly so: staminate aments short: anthers tipped with a spur: cones oval to globular, $1\frac{1}{2}$ -3 inches long, $1\frac{1}{2}$ -3 inches thick, purplish-brown: scales thick and somewhat fleshy, at length deciduous from the central axis: seeds oval, turgid, 4-6 lines long. On the highest peaks of the Cascade Mountains.

§ 2 Apophysis with a mucronate or blunt protuberance on the back. Anthers terminating in a semicircular or almost orbicular crest.

* Leaves serrulate, with stomata upon all sides: 4 nerves persistent.

+ Leaves in threes.

P. ponderosa Dougl. Lawson's Man. 351. A large tree 100-300 feet high and 2-12 feet in diameter with very thick red-brown bark, deeply furrowed and split into large flakes: the branches rather close spreading or slightly drooping: leaves on stout branchlets in the axils of strongly fringed somewhat persistent bracts, 5-11 inches long, the thin sheaths at first 9-10 lines long: staminate anthers cylindrical, flexuous, $1\frac{1}{2}$ -2 inches long: involucre of 10-12 scales: anthers with a large semicircular scarcely dentate crest: cones oval, 3-5 inches in diameter often 3-5 together, sessile or nearly so, of a rich brown color: scales thick at the apex: umbo high, with a short stout triangular straight or incurved prickle: seeds dark brown, 3-4 lines long: wing 10-12 lines long, widest above the middle: cotyledons 6-9. Common in the dry region, California to Brit. Columbia and Nebraska.

P. Jefferyi Oregon Com. A rather slender tree 100-200 feet high and

2-4 feet in diameter with dark brown to nearly black bark and rather sparsely branched with spreading or drooping usually crooked branches: leaves 4-10 inches long: staminate aments 1-1½ inch long, the stamens with a large semicircular crest: cones 5-12 inches long, dark brown, pendent, on peduncles 1-2 inches long apophyses rather thin, with a prominent umbo and stout triangular recurved prickles 5-8 lines long: cotyledons 7-11. On dry stony ridges southern Oregon.

P. attenuata Lemmon Mining and Scientific Press, Jan. 16th, 1891. A small tree 10-40 feet high and 3-18 inches in diameter with rough dark-colored red bark and short, ascending branches: leaves in threes, with thin close sheaths, slender, acute, with callous tips coarsely and remotely serrate firm and rigid, pale yellow or bluish-green, 3-7 inches long: staminate flowers in elongated spikes, cylindrical, 6 lines long: anthers terminating in irregular toothed broad crests, surrounded by 9 bracts: cones elongated-conical, pointed, very oblique at base strongly reflexed, 3-6 inches long, 1¾-2 inches thick, remaining closed for many years: scales flat, rounded at the apex, those of the outside being enlarged into prominent knobs armed with thick flattened incurved spines. On dry mountain sides southern Oregon to California.

+ + Leaves in twos.

P. contorta Loudon Arb. Brit. iv, 2292. A small tree 10-30 feet high with a short trunk 6-12 inches in diameter: leaves 1-1½ inches long, acute, with short callous tips, finely and sharply serrulate: staminate aments cylindrical, about 6 lines long, with orange-red anthers terminating in semi-orbicular nearly entire crests, surrounded by 6 scales: cones oval or sub-cylindrical 1-2 inches long, tapering toward the apex, very oblique at the base: scales thin, rounded at the apex which is transversely keeled and slightly thickened into narrow oblong dark umbos, armed with slender often recurved prickles, often remaining closed several years. Common on the coast and on the mountains California to Alaska and the Rocky Mountains.

P. Murrayana Oregon Com. A small slender tree 50-120 feet high and 4-12 inches in diameter, with very thin light grayish-brown bark and spreading or ascending branches: leaves 1-3 inches long, light green, delicately serrulate: staminate aments cylindrical, surrounded by 6-8 scales: cones oblong-cylindrical, 1-2 inches long slightly oblique at base, tapering toward the apex often opening at maturity and deciduous: seeds black, the wings 6-8 lines long. On the high mountains California to Brit. Columbia and the Rocky Mountains east of the Cascade Range.

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